



Great Lakes Navigation and Navigational Aids

Historical Context Study

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Introduction

Water is an alien element to humans, as a drowning victim well knows. Water is essential to all life on earth, yet it has the power to destroy most terrestrial flora and fauna. In small amounts, it is life-giving. In the form of oceans, rivers, and glaciers it has the power to tear, gouge, and heave the earth in spasms of creative destruction. Water is the dominant feature of the earth. To use it, understand it, to attempt control over it has been at the core of the development of human civilization. People live today on all of the earth's great land masses because of their success in navigating the sea. Yet the water is always an element of latent danger. Step from the warm sand of a beach into cool water or from the solid surface of a wharf and on to the heaving deck of a ship and you have entered the cold embrace of an elemental power. Joseph Conrad understood the existential nature of the human relationship with water when he wrote "to the destructive element submit yourself, and with the exertions of your hands and feet in the water make the deep, deep sea keep you up." That quotation from Conrad's epic novel *Lord Jim* encapsulates maritime history, the story of our struggle to live and work in the world of water.¹

This context study was written far from the ocean in the heart of a continent yet on the shore of a vast inland sea. The City of Chicago stretches for miles away from Lake Michigan with most of its residents living out of its sight, unthinkingly taking life from its waters piped mysteriously to their faucet. Tap water is tamed of its destructive power, processed and filtered of impurities. The raw nature of the Great Lakes of North America only becomes apparent to those who walk its wave washed shores or better still attempt to sail its dark waters. Only a few feet from the metropolis, with all if its urbane comforts, is a wilderness of beauty, adventure, and menace. More than three-hundred years after the first ship's crew went shrieking to their deaths beneath its waves, more than ten-thousand years since the first Paleo-Indian canoe was launched, the Great Lakes are a vast expanse of untamed primal energy, a domain alien to terrestrial life. This context study is about the people and the technologies that have made it possible to use the wilderness of North America's inland seas for commerce, communication, and recreation.

In some ways this, is an environmental history since its focus is on the way North Americans attempted to settle a watery wilderness. While the Great Lakes remain wild, the development of charts, lighthouses, buoys, improved channels, locks, harbors, and cities were all attempts to domesticate these great inland seas. Those features are as much a part of the process of "settlement" as such well-recognized markers of terrestrial development as roads, farms, factories, and towns. Yet while most environmental history places nature as the main narrative actor this study looks instead at the

¹ Joseph Conrad, *Lord Jim*, (New York: McClure, Phillips, & Company, 1900), 199.

technologies developed to harness the lakes to first build a region, then a nation, and eventually to impact the world.

The Great Lakes, some 90,000 square miles of open water shape a distinct region of the continent, although that region has received considerably less attention from scholars than other regions, such as New England, French Canada, the Deep South, Great Plains, or the Desert and Mountain West. Yet the communities that line its shores and are grouped into parts of eight American states and the Canadian province of Ontario share a common history of using, abusing, loving, and living with vast lacustrine resource. The people and communities of the region share experiences and an economy across a basin that extends 690-miles from north to south and 860-miles from west to east. In adapting to this incomparable natural resource, they have creatively borrowed from the technologies that humanity has developed to make the oceans of the world highways of commerce and avenues of empire. From ship design to lighthouses to maritime engineering and navigational techniques, the lakes followed the lessons learned on saltwater. However, the people of the inland sea have also been inventive in adapting their lives to the broad blue water horizon that extends from their shores. A folklore rich in weather and navigational collective knowledge developed among the sailors and fishermen and was passed on in stories, songs, and notations on charts. The lake marine pioneered an impressive range of innovations that subsequently were adopted on the oceans of the world. More striking were the unique adaptations that were required to effect commerce on the closed but nonetheless often tempestuous waters of the inland seas, from the birch bark canoe of the Anishinaabeg, to Mackinac boats and fish tugs, to the clipper schooners of William Wallace Bates and the whaleback freighters of Alexander McDougall, the lighthouses of Orlando Poe, and the inventive artificial harbors designed by generations of army engineers. While this rich history is preserved in a handful of maritime museums in the region, traditional historiography has regarded the Great Lakes as blank spaces between Midwestern states, an empty void amid the terrestrial cities, farms, and factories. This report argues that it is only by including the maritime dimension to regional history that role of the heartland in continental history can be properly understood.²

The navigational needs of this lacustrine region significantly shaped the history of the United States. Canals and urban development in the region laid the foundation for the creation of a national market and a dynamic capitalist economy. Tensions over appropriations needed for the safe navigation of the Great Lakes exasperated relations between sections of the country and ensured that the communities along the inland sea would be the strongest supporters of the Union cause during the Civil War. The boom in Great Lakes development that followed that conflict fueled the industrialization of the nation. The mines, mills, and factories of the region were the arsenal of democracy through World and Cold War conflicts. The light towers, lighthouses and light stations, harbor works, and ship museums left

² For a broad survey of the role of maritime history in United States development see: Benjamin W. Labaree, William M. Fowler, Jr., John B. Hattendorf, Jeffrey J. Safford, Edward W. Sloan, and Andrew W. German, *America and the Sea: A Maritime History* (Mystic, Conn.: Mystic Seaport, 1998); Anishinaabeg is the collective name for the Odawa, Potawatomi, and Ojibwe Indian peoples of the Great Lakes region who share a similar language and traditions and are known as the "Three Fires Confederacy."

by this history are the tangible reminders of a dynamic and unique regional history and the critical role it played in American life.

Nothing better symbolizes the drama of humanity's ambivalent embrace of the water than a lighthouse³ on a storm-washed shore. As of 2013 the Great Lakes were home to more than 400 standing lighthouses, 262 on the U.S. side and 151 on the Canadian side with almost 90 percent being active aids to navigation. For centuries a lighthouse was for the mariner a wayfaring marker, a beacon marking dangerous shoals, and a reminder that, when shipboard, land can be as much a danger as water. To the literary imagination, the lighthouse is a symbol of hope, an unwavering tower standing strong amid the gales of life. Something about the setting of a lighthouse on rocky shores or isolated islands against the backdrop of a watery horizon captures the artistic imagination. The overwhelming majority of books published about lighthouses are first and foremost collections of carefully composed photographs of isolated navigation aids. To the classical economist, lighthouses are a sterling example of a public good that can only be provided by government and without which private enterprise risks wreck and ruin. Yet even as the utility of lighthouses has been eclipsed by newer technologies there remains a strong desire for both government and the private sector to continue to bear the mounting costs of maintaining these structures. It is as if to lose a lighthouse a community would be severed from its connection to its maritime past.⁴

It is the role of the lighthouse and light station, related navigational aids, and maritime improvements in the development of the United States heartland that is at the core of this narrative. It is a history that tacks away from a dangerous shoal of American exceptionalism that exalts individualism and free enterprise economics at the expense of government. Individuals, no matter how daring or rugged, do not sail ships, it takes a crew pulling together to raise sail and stand watch. Similarly, ship owners or vessel masters do not build harbors, erect and maintain lighthouses, or chart the waterways. Such indispensable maritime infrastructure require more capital and on-going vigilance than even far-sighted capitalists can muster. A lighthouse is a symbol of a commitment to the common good. The establishment of a distinctive maritime province in the heart of North America occurred because of government action. From the building of the first lighthouses and harbors in the early nineteenth century, to the development of radar during World War II, to the maintenance of Global Positioning satellites and relay stations, it has taken the collective and cooperative action of the people of North America through their governments to "settle" the inland seas frontier. It is no accident of timing that while faith in the efficacy of government has ebbed in both the United States and Canada, the continued existence of lighthouses on the lakes as well as the continental coastline has been threatened. In the twenty-first century national governments, which once took pride in their network of light towers, are in the process of abandoning them as redundant. In many cases private and municipal

³ For the purposes of this narrative, the term "lighthouse" will be used as a general term, although such aids to navigation can be distinguished between light towers that lack residential space; and lighthouses, wherein light keepers resided.

⁴ Samuelson, Paul A. "The Pure Theory of Public Expenditure." *Review of Economics and Statistics* 36, No. 4 (November 1954): 387-89.

intervention has saved historic lighthouses. The United States and Canada who share such a rich legacy of cooperation and conflict across the Great Lakes today jointly face the challenge of assessing and saving the tangible heritage of the inland seas. Like a ship laboring in heavy seas those who care for that heritage look anxiously for a beam of light and a safe harbor.

CHAPTER 1

Wilderness Waters

In August of 1679 a small ship sustained by a stiff southerly breeze scudded across the dark green waters of Lake Huron. The ship was the *Le Griffon*, the first ship ever to sail on the upper Great Lakes of North America. She was on her maiden voyage and piloted by “Luke the Dane,” an arrogant mariner who had scant respect for the waters that earlier French explorers had named “La Mer Douce”—the Sweet Sea because of its lack of salt. Although he had never been on the lakes before, he kept *Le Griffon* under sail through the night, blindly plowing on into the unknown darkness. Near midnight the sound of crashing waves revealed “a great Point which jutted into the lake.” The pilot had to quickly alter his course and only just succeeded in clearing the point when the little ship was hit by “a furious gale.” *Le Griffon* was so buffeted by the wind and waves that all sails had to be close-reefed while the pilot desperately scanned the horizon for any sign of a safe anchorage. Through the night and into the following day the vessel was in distress. More than thirty disheartened men were aboard. Rene Robert Cavalier, Sieur de La Salle, who commissioned *Le Griffon* announced that their fate was now in God’s hands and bade his priest to lead them all in prayers. La Salle dedicated his to St. Anthony of Padua, the patron saint of the lost. Luke the pilot refused to join the prayers and cursed La Salle for bringing him to “a nasty freshwater lake to die, whereas he had lived long and happy navigating the ocean.”⁵

Perhaps their prayers were answered because the gale abated and *Le Griffon* was able to complete its journey safely to Lake Michigan. This first European voyage on the upper Great Lakes revealed much about the difficulty of navigating the little known waters of the inland seas that lie at the heart of the continent. These first European navigators had no knowledge of the of the wind and weather patterns. They had no charts to reveal the shape of the shoreline let alone the location of shoals. Prayer and an act of contrition was the closest thing they had to a navigational aid. Through divine intervention or, perhaps just dumb luck, La Salle and his men safely concluded their journey. Unfortunately, *Le Griffon*’s pilot learned no lessons. He did not respect “La Mer Douce” and on the return journey he ignored the gale warnings provided by Indian canoeists and he promptly sailed the ship into a watery grave.⁶

When *Le Griffon* was lost, the lakes took into their depth the lives of six men and thousands of dollars’ worth of property. The purpose of the ever more sophisticated systems of navigational aids that

⁵ Louis Hennepin, *A Description of Louisiana*, translated by John G. Shea (New York: John G. Shea, 1880), 95-96; Don Bamford, *Freshwater Heritage: A History of Sail on the Great Lakes, 1670-1918* (Toronto: Natural Heritage Books, 2007), 23.

⁶ Louis Hennepin, *A Description of Louisiana*, 95-96. There is some debate whether there had actually been a couple of smaller earlier vessels than *Le Griffon* ; but there is no doubt that *Le Griffon* was the first named vessel on the Great Lakes, the first to travel from one lake to the next, and the first to be designed and dedicated to commerce.

followed in the wake of this and other early shipwrecks has been to prevent the loss of life and property. It is a task that the early whale oil lamp beacons, Fresnel lens topped lighthouses, channel markers, and even modern radio beams and satellite-guided navigation systems can only imperfectly carry out. The deep and broad waters of the Great Lakes may be an inviting place for recreational boaters and beach lovers, they certainly are a critical medium for cheaply transporting bulk commodities, but they have always been and will ever remain alien to terrestrial life. Every year skilled mariners and experienced fishermen die in its waters—victims of wind, waves, fog, water spouts, shoals, ill fortune, and hubris. The history of the development of navigational aids on the Great Lakes is the story of how the United States Government has tried to modify the risks inherent in utilizing these wild, unpredictable waters. This story is intricately linked to the development of the North American heartland, the history of maritime technology, national economic and political history.

American Indian Navigation on the Lakes

Traditionally, there were two basic types of navigation. Celestial navigation relies upon the observation of heavenly objects—the sun, moon, and stars—to determine ones’ position on the earth. This was a method of way-finding critical to mariners who sailed out of the sight of land and it was perfected over the centuries, from the ancient Greeks and Polynesians to the perfection of longitude in the eighteenth century. Celestial navigation was not widely practiced on the Great Lakes because of their enclosed nature. Ships were rarely long out of the site of land. Therefore, for most of its history mariners on the Great Lakes relied upon what is known as Geo-navigation (also known as coastal piloting or dead reckoning). Simply put, the sailor relies upon geographic features to determine their position. This has always been the most common type of navigation as it relies upon knowledge of the waters that are being traversed more than an ability to take readings of the stars or sun. Historically lighthouses developed as aids to geo-navigation. They were man-made features designed to enhance a mariner’s ability to locate their geographic position.⁷

The first people to navigate the Great Lakes were American Indians and they relied upon geo-navigation. Even before the lakes reached their current shape and size and they were still the youthful creations of the departing glaciers, men and women built watercraft and used the lakes to journey to distant parts. Dugout canoes were undoubtedly the first watercraft in the region. All around the world this type of vessel played an early and important role in allowing societies to become exploiters of the waterways. These canoes could be crudely hacked out of tree trunks, but it did not take long for experience and craftsmanship to assert itself and more seaworthy dugouts were developed. As a tree was being hewn into shape, the builders would soak the interior in hot water to make the wood more pliable. Thwarts made of stout hardwood would then be wedged into the hull forcing the sides apart and creating greater width in the middle and giving the vessel both greater carrying capacity

12 ⁷ Nathaniel Bowditch, *American Practical Navigator: An Epitome of Navigation and Nautical Astronomy*, revised edition (Washington, D.C.: United States Government Printing Office, 1939), 19

and enhanced stability. Attachments to the bow and or stern allowed for creative decoration but also served the important purpose of helping to break waves and deflect them away from the canoe.⁸

The earliest evidence of a watercraft in the Great Lakes region is a dugout canoe recovered in Ohio that dates from only 1,500 BC. Yet it is likely that even Paleo-Indian peoples, who came to the region more than 10,000 years before, at a time when the lakes were still covered by ice sheets, had knowledge of watercraft. Archaic period (8,000-1,000 BC) Indians used canoes to travel long distances. Recent excavations of Archaic-period sites on Isle Royale indicate that related cultures felt confident enough to journey to the shores of Lake Superior to mine copper ore and even to regularly venture across broad stretches of open water.⁹

Indigenous America's enduring contribution to the region's maritime history was the development of the birch-bark canoe. When, where, and how this craft was developed is lost to both archaeology and history. It may have been an off-shoot of the skin covered boat that enjoyed limited prehistoric use in the Great Lakes area. The bark canoe featured a cedar frame covered by large strips of paper birch bark sown together with spruce tree roots and sealed with pitch. Where birch bark was not available elm bark was sometimes used. The success of the design was its lightweight yet durable character that bore wind and waves well on open water and was highly maneuverable in swift flowing rivers. It was a craft that opened the entire Great Lakes basin—even its most remote islands to Indigenous peoples. Birch-bark canoe journeys of thousands of miles for hunting, warfare, and trade became common. The canoe greatly expanded the geographic range of an Indigenous family's seasonal round of economic activity. Andrew J. Blackbird, who was among the last generation of Anishinaabeg (Odawa) people to grow up in what was still a fairly traditional lifestyle, described his family's long Great Lakes journeys. "In navigating Lake Michigan they used long bark canoes in which they carried whole families and enough provisions...In one day they could sail a long distance along the coast of Lake Michigan." At night they would put up wigwams made from poles and woven mats that were carried in the canoe. Some families would travel completely down the lake shore from the Straits of Mackinaw as far as the site of Chicago.¹⁰

There is a tendency among scholars of early navigation on the lakes to discount the possibility that Indigenous people occasionally made use of wind power to drive their canoes. It is true that we have no physical artifact evidence of Indigenous sails, but that is hardly surprising since there is little such evidence for the existence of canoes. Louis Hennepin, the Recollect priest who accompanied La Salle on *Le Griffon*, however, offers strong evidence for the aboriginal use of sails. In his account of his North American adventures, Hennepin wrote, "when the wind is favorable, they are expedite to a Miracle,

8 Kimberly Monk, "The Development of Aboriginal Watercraft in the Great Lakes Region," *Totem: The University of Western Ontario Journal of Anthropology*, Vol. 7, No. 1 (1999), 71-77; for more on canoe types see: Edwin Tappan Adney, Howard I. Chappelle, *The Bark Canoes and Skin Boats of North America*, (Washington, DC: Smithsonian Institution, 1964).

9 Monk, "The Development of Aboriginal Watercraft," 71-77; Caven Clark, "Archaeological Survey and Testing, Isle Royale National Park, 1987-1990 Seasons" Edited by F.A. Calabrese. *Midwest Archaeological Center Occasional Studies in Anthropology*, No. 32, 1995.

10 Andrew J. Blackbird, *A History of the Ottawa and Chippewa People* (Ypsilanti, Mich.: Ypsilantian Job Printing House, 1887), 32-33.

for they then make use of little Sails made of the same Bark, but thinner than that of the Canoes.” Hennepin was in the region early enough that much of traditional Indigenous lifeways remained intact. If Indigenous people had learned to use a sail from the Europeans, they had access to cloth to make a sail in the European manner. Instead, Hennepin describes the Indigenous people using thin sheets of bark as their sail which likely indicates the continuation of pre-Columbian practice. Peoples all over the world learned on their own to harness the winds by means of a sail, among them were the Indigenous people of the Great Lakes region.¹¹

There were few navigational aids available to Indigenous mariners. They relied on dead reckoning for planning their course and intimate knowledge of the shore line to make their way. Place names given to coastal features, to which stories would often be attached, helped to keep alive knowledge of coastal features. For example, the Anishinaabeg legend behind the naming of Sleeping Bear Dunes accounts for the prominent headland and the two islands, North and South Manitou that help form the Manitou Passage. In the story a raging forest fire on the Wisconsin shore drove a mother bear and her two cubs into the lake. As they swam to the safety of the Michigan shore, the two cubs became tired and drowned. The Great Spirit Manitou then created the great dune in memory of the grieving mother bear and made North and South Manitou Islands to mark where the two cubs perished. Place names contained key navigational information. The missionary priest Father Frederic Baraga recorded that the Anishinaabeg (Ojibwe) told him the name for Keweenaw meant “The place where they traverse a point of land by foot.” In contrast the name for the point of land near De Tour, Michigan, was the “point which we go around in a canoe.”¹²

The Anishinaabeg had a detailed knowledge of the night sky, although it is unclear if this knowledge was applied for navigation purposes. They certainly knew of the North Star and noted that it did not set below the horizon. Like the ancient Greeks they noted constellations, and traditions developed that explained their presence and preserved cultural information. The Anishinaabeg (Ojibwe) constellation Gaadidnaway represented Mishipeshu, the great, malevolent spirit panther with serpentine features that dwelled at the bottom of the Great Lakes. The constellation rises in the winter sky and is overhead Lake Superior in spring. Traditionally, this was a sign that it was time to relocate from winter hunting camps to the sugar bush as well as to warn travelers not to trust the melting ice on the lakes.¹³

Like the men aboard *Le Griffon* Indigenous people regarded spiritual intercession as an important part of prudent navigation. The sprinkling of tobacco upon the water before embarking on a journey was regarded as a gesture of respect to the Manitous that lurked beneath the waves. A more serious offering would be the sacrifice of a dog. Seventeenth-century missionary to the Anishinaabeg (Odawa)

11 Historians who discount aboriginal use of sails include Bamford, *Freshwater Heritage*, 3-4 and Edwin Adney and Howard Chappelle, *Bark Canoes and Skin Boats of North America* (Washington, DC: Smithsonian Institution, 1964), 10. For Hennepin quotation see, *A New Discovery of a Vast Country in North America*, edited by Ruben Gold Thwaites, (Chicago: McClurg, 1903), 37.

12 Virgil Vogel, *Indian Place Names in Michigan* (Ann Arbor: University of Michigan Press, 1986), 134-36.

13 Annette S. Lee, William Wilson, Jeff Tibbetts, Carl Gawboy, *Ojibwe Giizhig Anang Masinaa'igan, Ojibwe Sky Star Map Constellation Guidebook: An Introduction to Ojibwe Star Knowledge* (North Rocks, Calif.: Lightning Source-Ingram Spark, 2014), 1-10.

Claude Allouez, S.J., reported that “[d]uring storms or tempests, they sacrifice a dog, throwing it into the Lake. ‘That is to appease thee,’ they say to the latter; ‘keep quiet.’” Anishinaabeg (Ojibwe) embarking from Grand Portage onto Lake Superior placed offerings at the foot of Manido Gee-shigance, or Spirit Little Cedar, a gnarled tree standing alone at the tip of the point. In 1794 John Tanner was part of a ten canoe flotilla that embarked on a Lake Superior traverse. After paddling out several hundred yards, they stopped and spread tobacco on the water while the leader said this prayer to the Great Spirit: “You have made this lake, and you have made us, your children; you can now cause that the water shall remain smooth, while we pass over in safety.” The old chief then sang a “religious song” while they made the crossing. In Anishinaabeg (Ojibwe and Odawa) oral tradition, the lakes were the haunt of powerful creatures that controlled the motion of the water. One of the most popular oral traditions of the Anishinaabeg (the Ojibwe and Odawa) cultural hero Nanabozho told of his attempt to kill a great serpent that dwelled in the lakes. In an act of revenge the serpent then sent a great flood that inundated all the land. Fortunately, Nanabozho was able to reconstitute the land. Another oral tradition told of Mishipeshu and its perpetual battle with the Manitou of the sky, the revered Thunderbirds. Mishipeshu would sometimes reveal himself in the form of a sudden fog or violent storm upon the lakes. Pictographs of Mishipeshu have been found upon the rock walls of several lakes most famously at Agawa Bay on the north shore of Lake Superior. Such art work may have originated as a warning to other travelers or as an attempt to appease the lake monster. These traditions all serve to underscore that the Anishinaabeg saw the Great Lakes as a living entity with which humans had a relationship that could at least in part be managed through ritual respect and negotiation.¹⁴

Fur Trade Canoes

The Iroquoian and Anishinaabeg peoples of the Great Lakes shared their knowledge of the inland waterways and canoe navigation with the first Europeans who entered the region. It was only by adopting the technology and methods of the Indians that first the French and later the English were able to reach and exploit the resources of the inland seas. The canoe was the key to early European trade on the Great Lakes, yet few of the white men ever developed the skills necessary to build their own vessels. Most canoes used in the fur trade were made by Indian men and women. The same was true of the snowshoes and toboggans needed for winter travel. One of the route finding techniques that the fur trade voyageurs adopted from the Indigenous people in the Great Lakes region was the use of lob trees. Lob trees were usually prominent pine trees that were located near the site of portages or channels that might otherwise be hard to locate. A nimble voyageur would climb the tree and lob off its middle branches making the crown of the tree stand out and serve as way-finding device. Lob trees were sometimes named in honor of individuals and their names would be carved upon a lower

¹⁴ Claude Allouez, S.J., *The Jesuit Relations and Allied Documents*, Volume 50, edited by Ruben Gold Thwaites (Cleveland: William Burrows Company, 1896-1901), .286; Andrew J. Blackbird, *A History of the Ottawa and Ojibwe People of Michigan* (Ypsilanti, Mich.: Ypsilanti Jon Printing House, 1887), 76-77; Serge Lemaitre, “Mishipeshu,” *Canadian Encyclopedia*, <http://www.thecanadianencyclopedia.com/en/article/mishipeshu/>, accessed September 2014; Timothy Cochrane, *Minong—The Good Place: Ojibwe and Isle Royale* (East Lansing: Michigan State University Press, 2009), 25.

portion of the trunk.¹⁵

Fur traders would mostly navigate the Great Lakes via canoes. During the eighteenth century a particular type of vessel known as a *canot du maitre*, or master's canoe, was developed to meet the particular needs of the traders. These birch-bark craft were usually thirty-six feet long and up to six feet wide at their midsection. It could weigh up to six-hundred pounds when wet, but it was capable of carrying three tons of cargo. Fur traders heading west from Montreal followed interior rivers west until they reached Lake Huron and thence to Michilmackinac where they discharged their cargoes, or continued further west to the depot at Grand Portage on Lake Superior. Traders operating out of Albany, New York, used the Hudson-Mohawk River route to Lake Erie and then paddled west along the south shore of Lake Erie to Detroit. *Canot du maitre* usually went west in groups known as brigades of between three and six canoes. The lead canoe would have a guide who was an expert in knowledge of the terrain and hazards to be encountered on the way. Voyageurs paddled from before dawn to dusk, taking a break every hour or so for a short rest at which time the canoe men inevitably brought out their clay pipes for a short smoke. When measuring the distance between places, fur traders often use the number of pipe breaks from one point to another. One "pipe" was figured to be between ten and twelve miles. Canoe guides had in their head a mental map of the Great Lakes in which the distance from an island to a bay, from a good camping place, to a portage would be measured by the number of "pipes."¹⁶

Imperial Rivalries and Navigation

By the 1670s decked sailing ships like *Le Griffon* were built on the lakes to help facilitate the fur trade and to project the military power of France's colony on the St. Lawrence River. In the middle of the eighteenth century the French had a virtual flotilla on Lake Ontario with four schooner-rigged ships each armed with brass cannon. Sometime before 1735 the French also built the first ship to sail on Lake Superior. The vessel was built about seven miles above the falls at Sault Ste. Marie and it has been described as a barque, meaning it had at least two masts, one of which was rigged with a square sail. This ship appears to have been in use for many years thereafter. Although the French devoted time and precious resources to outfitting a small number of Great Lakes vessels and they produced several accurate general maps of the lakes, they made no attempt to chart the inland seas or to develop navigational aids. Canoes continued to be the dominant commercial vessels on the lakes. On the eve of their expulsion from the region, the commander of Fort Niagara complained that his countrymen had never even circumnavigated Lake Erie let alone made "bearings of its shores, the depths of its bays, and the anchorages that occur..."¹⁷

¹⁵ Carolyn Podruchny, *Making the Voyageur World: Travelers and Traders in the North American Fur Trade* (Lincoln: University of Nebraska Press, 2006), 102 ; for more about lob trees see, Clifford and Isabel Ahlgren, *Lob Trees in the Wilderness* (Minneapolis: University of Minnesota Press, 1984).

¹⁶ David Chapin, *Freshwater Passages: The Trade and Travels of Peter Pond* (Lincoln: University of Nebraska Press, 2014), 41-42 ; Podruchny, *Making the Voyageur World*, 104-11.

¹⁷ Henry Howland, "Navy Island and the First Successors to the Griffon," *Publications of the Buffalo Historical Society*, Vol. 6 (1903), 18-19.

In 1760 the British Empire completed its conquest of New France and began a regime that would see an expansion of commercial exploitation of the lakes and the first steps to create navigational aids on the Great Lakes. Within a year they had two vessels—the schooner *Huron* and the sloop *Beaver*—built for duty on Lake Erie and the upper lakes. In the decade that followed five more vessels would rise from the stocks and cast off on to the lakes. These vessels participated in making soundings of the shallow waters of Lake St. Clair which would long plague the movement of vessels north from Lake Erie to Lake Huron.¹⁸

A thread that runs through the entire history of Great Lakes navigation is the reluctance of saltwater sailors to take seriously the power of the inland seas. Sometime in the late 1760s, the British schooner *Gladwin* was lost on Lake Huron largely because her master obstinately refused to take the time to properly ballast the vessel. When caught in heavy weather the vessel capsized and took the entire crew with her. James Fennimore Cooper captured this dangerous willful arrogance in his 1840 novel *The Pathfinder, or The Inland Sea*. Set on Lake Ontario during the French and Indian War, the hero is the young lake pilot Jasper Western nick-named *Eau Douce* (freshwater) by the American Indians. He escorts a veteran mariner from the ocean to Ontario's shores. On first glance at the lake, the saltwater man blustered; "Just as I expected. A pond in dimensions and a scuttlebutt in taste." When Jasper points out that it is impossible to see from one coast of the lake to the other the mariner says: "The coasts of the ocean have farms and cities and county-seats, and in some parts of the world, castles and monasteries and lighthouses—ay,ay—lighthouses, in particular, on them; not one of all which things is to be seen here...I never heard of an ocean that hadn't more or less lighthouses on it; whereas, hereaway there is not even a beacon."¹⁹

The complete lack of lighthouses on Lake Ontario, let alone the Great Lakes, was remedied in 1781. Since the early eighteenth century, the French had maintained an large limestone fortress near where the Niagara River enters Lake Ontario. At its core was an imposing two-story, limestone structure the French called "Maison a Machicoulis," which later became popularly known as "the French Castle." The British captured the fort in 1759 after a nineteen day siege. The American Revolution should have brought the fort into the control of the new United States, but British military authorities refused to relinquish control of their posts along the Great Lakes. For thirteen years the British used the base to build military alliances with Indian tribes along the young nation's northern border. In 1781 the British built the first Great Lakes lighthouse by constructing a beacon atop the "French Castle." The location was an important one for commerce because the fort was located at the end of the portage trail around Niagara Falls and the beginning of navigation on Lake Ontario. This pioneer navigational aid was likely illuminated by a whale oil lamp. The British were prompted to construct the beacon by the disastrous loss of the sloop *HMS Ontario*, which foundered amid a Halloween night gale in 1781.

¹⁸ Henry Howland, "Navy Island and the First Successors to the Griffon," 19-33.

¹⁹ Howland, "Navy Island and the First Successors to the Griffon," 32-33; James Fenimore Cooper, *The Pathfinder: Or, The Inland Sea* (New York: Sully and Kleinteich, 1876), 120-21.

The wreck cost the British their largest and most powerful vessel on the Great Lakes and took the lives of 130 men. The light was maintained by the United States Army when the U.S. finally was able to occupy the site in 1796 following the signing of the Jay's Treaty. It went dark, however, in 1803. A year later the British established a new lighthouse near their new fort on the Canadian side of the lake. In 1822 Congress voted funds to reactivate the light and to construct a new wooden tower atop the "French Castle." That lighthouse remained in service until after the Civil War.²⁰

The Articles of Confederation government had no real sway over the Great Lakes frontier. The leaders of this first U.S. Government, however, harbored great ambitions for the West and these were expressed in the Ordinance of 1785, which established a system for the survey and sale of all of the lands in the public domain. The Congress also passed in 1787 the Northwest Ordinance. This act provided a structure of administration for the lands north and west of the Ohio River and created a formula by which this territory would be divided into new states that could enter the federal union on an equal basis with the original thirteen. The ordinance did much to shape the future development of the Great Lakes region. Famously it outlawed slavery in the region and it provided the first legislation on Great Lakes navigation. The ordinance stipulated that:

[t]he navigable waters leading to the Mississippi and St. Lawrence, and the carrying places between the same, shall be common highways forever free, as well to the inhabitants of the said territory as to the citizens of the United States, and those of any other States that may be admitted into the confederacy, without any tax, impost, or duty therefor.

This key provision recognized that the Great Lakes constituted an interconnected system of waterways in which all states of the Union and all U.S. citizens had a stake.²¹

The occupation of the Great Lakes forts by the United States in 1796 was the true beginning of U.S. navigation on the lakes. Fort Niagara, Detroit, and Fort Mackinac became outposts for the projection of United States power into the region and bases from which merchants could enter the region's bustling fur trade. The United States built two vessels for public use on the Upper Great Lakes—the brig *Adams* and the much smaller sloop *Tracy*. A third ship the *Oneida* was operated below the falls on Lake Ontario. The *Adams* and *Tracy* were essential in transporting troops and supplies to the remote outposts such as Fort Mackinac at the Straits between Lakes Michigan and Huron and Fort Dearborn at the site of Chicago. A small number of private vessels also plied the lakes carrying cargoes of furs or salted fish to the east and bringing back food and trade goods.²²

Commerce and navigation on the Great Lakes was severely retarded by the three-way struggle for control of the region among Great Britain, the United States, and an alliance of western Indians that included elements of the Shawnee, Miami, Odawa, Potawatomi, and Ojibwe. The British goal was to protect their new colony of Upper Canada (modern Ontario), by fostering the emergence of an autonomous American Indian territory in the Great Lakes region, which was largely made up

²⁰ Daniel Dempster and Todd Berger, *Lighthouses of the Great Lakes* (Minneapolis: Voyageur Press, 2002), 19-20.

²¹ Ordinance for the Government of the Territory of the United States North and West of the River Ohio, 13 July 1787, Our Documents, <http://www.ourdocuments.gov/doc.php?doc=8&page=transcript>, accessed October 2014.

18 ²² Theodore J. Karamanski, *Schooner Passage: Sailing Ships and the Lake Michigan Frontier* (Detroit: Wayne State University Press, 2000), 45.

of Loyalists driven from their homes by the American Revolution. With some skepticism of British reliability, the Indian leaders accepted British military aid and between 1790 and 1794 successfully repulsed U.S. attempts to assert control of the area south of Lake Erie. In one stunning engagement in 1791, the allied tribes utterly destroyed a large portion of the United States Army, which left close to one-thousand men dead on the battlefield. The United States did not recover until 1794 when at the Battle of Fallen Timbers, they were able to defeat the alliance and force a series of land cessions upon the Indians. Hostilities flared again in 1811 when a new American Indian alliance was created by the Shawnee leader Tecumseh. It was smaller than the previous alliance but no less determined. The U.S. entry into the War of 1812 was fueled in part by a desire to crush Tecumseh by capturing Upper Canada and the Indian's British base of support.²³

The War of 1812 must be properly seen as a war for control of the Great Lakes region and the most important battles of that war were fought on and near the inland seas. British ability to capture U.S. vessels and control Lakes Michigan and Huron allowed a small number of red coats and a large number of Indian allies to capture or destroy Fort Mackinac, Fort Dearborn (Chicago), and Detroit. Both Britain and the U.S. created makeshift fleets to contest control of Lake Erie and Lake Ontario. These fleets were made up on converted merchant ships and new and increasingly larger warships constructed at shipyards on the lakes. The 1813 victory by the United States in the Battle of Lake Erie allowed them to partly recoup their losses in the West. After that an escalating race to build larger and more powerful fleets ensued, the Royal Navy was by far the more skilled competitor. It is fortunate for the United States that peace came in 1815 as the British were on the verge of sending into battle several ships-of-the-line that mounted as many as 102 cannon. The war did end on the terms of *status quo ante-bellum*. The British deserted their Indian allies and the United States was able to force upon the American Indian tribes land cession treaties and eventually in many cases treaties of removal from the region.

The War of 1812 essentially removed the British-Indian barrier to the expansion of the U.S. population and commerce into the Great Lakes region. It also ensured that the Great Lakes would remain divided between two emerging nations. In the half century that followed the war, the region was transformed from being a remote and dangerous frontier into the U.S. heartland. This transformation was made possible by a commercial and transportation revolution in which navigational aids played an important if unsung part.

²³ For more on the three-way military struggle for the Great Lakes see: David Curtis Skaggs and Larry L Nelson, editors, *The Sixty Years' War for the Great Lakes, 1754-1814* (East Lansing: Michigan State University Press, 2001).

C H A P T E R 2

A Market Revolution on the Lakes

Samuel Ward was both surprised and upset. He had just skippered the first boat from the Upper Great Lakes through the Erie Canal to the Hudson River and finally to New York City. His vessel was a little twenty-eight-ton schooner named the *St. Clair*. Ward had sailed her from Detroit to Buffalo where he took down the vessel's rigging and masts and then towed her up the canal with two horses he had brought with him. Upon reaching the Hudson the vessel was re-rigged and Ward proudly sailed into the United States greatest port city. He expected a bonus or prize of some kind. He expected to be toasted and feasted. Instead he was presented with a bill. Ward had not calculated the toll charges on what was a historic passage. Putting aside his disappointment, Samuel Ward did what he did best—dickered with Gotham's merchants to get the best deal for his cargo of potash, furs, and black walnut. On the return trip, he took a cargo of manufactured goods, salt, and a number of passengers at fifteen dollars a head. Back in Detroit he complained of his treatment by the people of New York, but nonetheless counted out a six-thousand dollar profit.²⁴

The arrival of Samuel Ward and his little schooner in New York City was the first ripple of what would become a powerful wave of commercial traffic between the Atlantic Coast and the Great Lakes region. Ward was emblematic of the rising tide of economic activity in the West and the growing importance of commercial activity in the American Republic. Born in Rutland, Vermont, the son of a Baptist preacher, Ward gained his first experience on the lakes during the War of 1812 when he operated a small coasting vessel that carried supplies to U.S. forces along the shores of Lake Ontario. When peace came he headed west first to Ohio and later to Lake St. Clair in the Michigan Territory. From a log cabin home in the wilderness Ward operated a small sailing ship engaged in what was known as the "lakeshoring trade." Essentially, this meant that Ward sailed between Lake Michigan and Detroit in search of cargoes, brokered deals as he went, and risked a great deal as he entered uncharted waters. Sometimes he carried barrels of salted fish, at other times furs, and occasionally passengers. Little schooners like the *St. Clair* also functioned as floating stores. From his deck he sold flour, sugar, tea, gunpowder, and whiskey to isolated settlers. His voyages paid well enough that he was able to expand his operations by building a small fleet of some of the earliest commercial vessels on the upper lakes. Three new schooners slid off the stocks from his own shipyard.²⁵

Ward, however, was not content to be a mere mariner. He was a restless Yankee who sought profit

24 William L. Bancroft, "Memoir of Captain Samuel Ward, with a sketch of early Commerce on the Great Lakes," *Michigan Pioneer and Historical Collections*, 21, (1892), 336-67; Friend Palmer, *Personal Reminiscences of Important Events and Descriptions of the City For Over Eighty Years* (Detroit: Hunt & June, 1906), 41.

25 Bancroft, "Memoir of Captain Samuel Ward," 338.

wherever it could be found. He planted orchards around his homestead and raised herds of cattle and swine. When chinking the walls of his log cabin home, he discovered pure clay and shortly thereafter erected a kiln and established a brick-making yard. He sold brick in nearby Detroit and also erected a large brick residence that he operated as a tavern. Money flowed into his hands from his ships, his sawmill, his shipyard, his brickyard, and his tavern. When he sailed for New York City in June of 1826, Ward was consciously extending his web of commercial activities to an emerging national market. In the years that followed, he invested in steamboats and railroads and eventually retired as one of the first millionaires in the Great Lakes region.²⁶

Captain Samuel Ward was one of thousands of American citizens in the large commercial cities of the East and on the fringes of the western frontier who participated in a profound transformation of their nation. When Samuel Ward was born in 1784, nearly all of the new nation's 3.9 million inhabitants made their living from agriculture. The bulk of their harvest was reserved for home consumption. The limited merchant community largely focused on trading surplus U.S. agricultural produce to the West Indies. Eighty years later, when the nation was split by a ghastly civil war, its economic life had been vastly transformed. Most Euro-Americans still lived on farms, but the orientation of those farms had shifted from home subsistence to trade in national and even international markets. Instead of merely feeding their families, their harvest provided subsistence for millworkers in Manchester, England, or Lyon, France. Instead of bartering with neighboring mid-century farmers, they dealt with elevator operators and commission house agents. Thousands of farmers' sons found work in towns and growing cities that bustled with shops and factories churning out textiles, charcoal, iron, household goods, farm machinery, wagons, and weapons. Entire new "white-collar" professions had been created to protect patents on new inventions, to insure products being transported, or to invest in expansive new factories, and to finance an ever expanding network of canals and railroads. The transformed nation now produced more than two billion dollars in goods and services and exported more than four-hundred million dollars in produce and products. Since the early 1990s, historians have focused their attention on the dynamic period between the War of 1812 and the Civil War. The period has been dubbed "the market revolution" because of the tremendous escalation of commercial activity during those years and the profound impact that this growth had on the nation's social, cultural, and political life.²⁷

The expansion of navigation and navigational aids played a significant role in the creation of a national market. Historians debate whether or not the tremendous expansion of commercial activity in the ante-bellum period constituted a "revolution" or whether it was merely an evolution of a commitment to capitalism that was deeply engrained in the nation's DNA. Historian Daniel Walker Howe, for example, acknowledges the expansion of market relations during the era, but he points out

²⁶ Bancroft, "Memoir of Captain Samuel Ward," 340-42.

²⁷ John Lauritz Larson, *The Market Revolution in America: Liberty, Ambition, and the Eclipse of the Common Good* (New York: Cambridge University Press, 2010), 1; The cornerstone of historiography on the market revolution is Charles Sellers, *The Market Revolution: Jacksonian America, 1815-1846* (New York: Oxford University Press, 1991).

that the defining element in the history of the era was the remarkable improvement in communication between the diverse regions of the nation. Howe argues that there were greater improvements in communication during the thirty years that followed the end of the second war with Britain than in all the previous centuries. Inventions such as the telegraph and the railroad were truly revolutionary, yet when combined with the extensive development of canals, river and harbor improvements, and the deployment of steamboats on the nation's inland and coastal waters, it is clear that a revolution occurred in the movement of people, products, and the communication of information. By 1839 the number of steamboats on the Upper Great Lakes had increased from one in 1825 to sixty-one and there were thirteen improved Great Lakes harbors with lighthouses where ten years before there had been none. On the lake frontier such changes were revolutionary.²⁸

The concept of a “communication revolution” as opposed to a largely capitalist driven “market revolution” recognizes that governmental institutions played a profound role in the building of the first national commercial market. The period after the War of 1812 saw an unprecedented influx of state and federal funding into endeavors that on the surface appeared to benefit one area or region; yet when taken altogether accelerated the movement of goods and services across the nation. Such an aggressive role by the government in national life and economics was by no means welcomed by all U.S. citizens. Throughout the period between 1815 and 1865, a large number—often a majority of Americans—took their cue from Thomas Jefferson by articulating a desire for a small government with limited resources and power. The expansion of navigation and navigational aids on the Great Lakes has to be seen in the light of a tremendous expansion of commercial activity abetted by a communication and market revolution amid political controversy over the proper role of government in economic development.

The Lighthouse Act and the Ambiguous Legacy of the Founders

For the first half of the nineteenth century the task of improving navigation conditions on the Great Lakes was beset by controversy and sectional division. The first sign of this political division was manifested in 1789 immediately after the establishment of the federal government under the Constitution of the United States. Only one week after the House of Representatives first met in session, the issue of lighthouse construction stirred up sectional disagreement. It began when James Madison of Virginia proposed a resolution to impose a tariff duty on foreign goods entering the United States. Madison saw this action as an essential measure to raise funds for the operation of the national government. More specifically, he argued that the duties were necessary “for support of light-houses, hospitals for disabled seamen, and other establishments incident to commerce.” The issue, however, soon became much more complicated as legislators sought to amend the bill to meet the needs of their constituents. In particular, northern commercial states sought to include duties that would protect

²⁸ Daniel Walker Howe, *What God Hath Wrought: The Transformation of America, 1815-1848* (New York: Oxford University Press, 2007), 4-5; John W. Larson, *A History of Great Lakes Navigation* (Fort Belvoir, Va.: National Waterways Study, U.S. Army Engineer Water Resources Support Center, Institute for Water Resources, 1983), 6.

nascent U.S. manufacturers from more cheaply made foreign goods. Southern legislators whose states had few manufacturing interests and relied heavily on imported goods objected. As the legislation became more controversial, it was decided to separate out the issue of lighthouse construction from the legislation to tax imports.²⁹

In July 1789 Congress debated a new bill for “the Establishment and Support of Light Houses, Beacons, and Buoys, and for authorizing the several States to provide and regulate Pilots.” The bill was strongly backed by northeastern legislators whose states were deeply involved in maritime commerce and whose waters presented considerable challenges for navigation. At the time, there were numerous beacons or lighthouses along the New England coast, yet south of Chesapeake Bay, there were only two along the southeastern shore. It was no surprise, then, when South Carolina’s Thomas Tucker objected to the notion of federal control of lighthouses, and he proposed an amendment that would keep lighthouses under state jurisdiction. Using rhetoric that would become all too familiar, Tucker called federal control of lighthouses “an infringement of states’ rights.” Northern representatives countered with a more flexible reading of the constitution by arguing that the document gave “the regulation of commerce to Congress” and, therefore, it logically “conferred every power which was incidental and necessary to it.” In the Senate, concessions were made to win southern support for the bill. These included leaving the regulation of river and harbor pilots to the states and a specific provision for the construction of a lighthouse in Chesapeake Bay. A late attempt was made to include a provision in the bill for the federal government to undertake the removal of obstructions from rivers, ports, inlets, and harbors. This provision, however, failed to win broad support and the issue of river and harbor improvements would prove one of the most divisive in pre-Civil War America. On August 7, 1789, President George Washington signed the Lighthouse Act into law.³⁰

The Lighthouse Act debate revealed a fundamental problem that would impede federal action to improve interstate navigation initiatives. The Constitution provides no specific provision for federal aid for internal improvement projects. In fact, a close reading of the Constitutional Convention proceedings indicates clear-cut opposition to such an idea. Early in the proceedings, Benjamin Franklin and James Madison proposed provisions that would specifically empower the United States government to build roads, canals, and other improvements “to secure easy communication between the States.” However, their motion was defeated by a sectional vote. On that occasion, it was New England that saw no need for canals and roads, and it was Southern states that wanted better access to the West. Fortunately, that vote did not settle the issue. This was because some of the new nation’s most important political figures were strong supporters of an enhanced system of interstate commerce and communication.³¹

29 Stanley Elkins and Eric McKittrick, *The Age of Federalism: The Early American Republic, 1788-1800* (New York: Oxford University Press, 1991), 62-72; *The Lighthouse Act of 1789* (Washington, D.C.: U.S. Senate History Office, 1991), 2-3.

30 *Lighthouse Act of 1789*, p.10.

24 31 Max Farrand, editor, *The Records of the Federal Convention of 1787*, Volume 2 (New Haven: Yale University Press, 1911), 615-16.

As Madison's support for the Lighthouse Bill suggests, the legislator did not give up his support for internal improvements because there was no specific constitutional authority for such action. In the *Federalist No.14*, he argued that "intercourse throughout the nation" aided by "new improvements" was critical to holding a large and geographically diverse nation together. As president he called on Congress to create "a general system of internal communication and conveyance" and specifically pointed to proposals for major navigation improvements such as a canal between the Hudson River and the Great Lakes. Yet when the time came to offer federal support for the Erie Canal, Madison balked. Thomas Jefferson in his messages to Congress also cited the benefit to national unity from improved transportation, but reflecting his adherence to a strict interpretation of the Constitution, he also called for a "corresponding amendment" before action was taken to build canals or to improve waterways. The foremost of the "founding fathers," George Washington, was a vigorous advocate for navigational improvements. He had been deeply involved in efforts to drain Virginia's Dismal Swamp and to improve the upper Potomac River so that it might serve as a commercial connection to the Ohio River Valley. In his 1796 Farewell Address to the nation, he warned them against "Geographic discriminations—Northern and Southern, Atlantic and Western—whence designing men may endeavor to excite a belief that there is a real difference of local interests and views." The key to avoiding this problem, he suggested, was "the progressive improvement of interior communications by land and water." Thus the founders gave to the new nation a belief that internal improvements were critical to national unity, yet they had provided a Constitution in which the legality of federal support for such a program was at best ambiguous.³²

The erection and maintenance of lighthouses along the nation's Atlantic Coast was an early and important exercise in state building. Under the authority of the Lighthouse Act, Congress voted to expand the handful of colonial era beacons it had inherited into a truly national system of navigational aids. Where most colonial era lighthouses were erected to guide vessels to a particular port, the beacons of the new republic erected at Bald Head, North Carolina, Montauk Point, New York, and Cape Henry, Virginia, were coastal lights located to aid trade between states and other nations. They represented the national government's pursuit for the general good. The lighthouses were located at sites remote from existing population centers. Building and maintaining a light at such locations exceeded the capability of the local communities or colonies that had erected earlier beacons. To international shipping, the beacons became obvious symbols of U.S. national sovereignty. To American citizens they were a sign of the credibility and stability of the new republic created by the Constitution.³³

The First Lighthouses on the Great Lakes

Although the Lighthouse Act granted the federal government responsibility for lighthouse maintenance and construction, no action was taken on the Great Lakes until 1811. In that year Congress authorized

³² John Seelye, *The Beautiful Machine: Rivers and the Republican Plan, 1755-1825* (New York: Oxford University Press, 1991), 251-52, 260-61.

³³ Allen S. Miller, "The Lighthouse Top I See": Lighthouses as Instruments and Manifestations of State Building in the Early Republic," *Buildings & Landscapes: Journal of the Vernacular Architecture Forum*, Vol. 17, No. 1, (Spring 2010), 13-3.

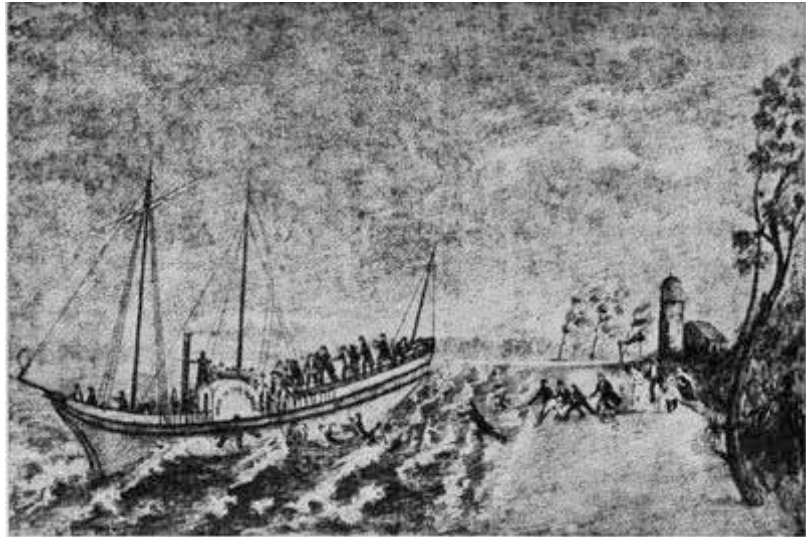
the construction of two lighthouses at strategic locations along the Lake Erie shore. Where Buffalo River entered the Lake Erie a town had developed with much loftier aspirations than its low collection of log cabins would have seemed to warrant. Yet federal officials deemed the settlement was the appropriate place to locate a navigational aid that would guide vessels to the head of the lake. A second lighthouse was approved for the mouth of Erie Bay on the Pennsylvania shore of the lake. The site where a narrow peninsula jutted out into the lake, like a broad semicircle, offered the promise of a sheltered anchorage. Unfortunately, a sand bar partly blocked its mouth. Nonetheless, a number of merchant schooners operated out of the bay. When war broke-out with Great Britain one of those schooner men, Daniel Dobbins, traveled to Washington, D.C., to impress upon the government the strategic value of the site. His mission was responsible for Erie Bay being selected as the site where Commodore Oliver Hazzard Perry built the bulk of the fleet that won the United States' mastery over Lake Erie's waters in the Battle of Lake Erie in 1813. The danger of enemy action, however, prevented either lighthouse from being constructed until the war was over.³⁴

It was not until 1818 that these two lighthouses were actually erected. It is impossible to say whether it was the Erie light or the Buffalo light that had the privilege of being the first U.S. Great Lakes navigation aid and so the two have been forced to share the honor. They also shared the fate of many other pioneers in that being first did not make them particularly successful. The Buffalo lighthouse was a conical stone tower a mere thirty feet in height. The keeper's house was likely a log cabin. The weak beam of the light together with its low height soon drew the complaints of mariners. When the Erie Canal was completed, these objections were joined in chorus by canal boat operators who could not even see the light. In 1826 Congress ordered that a replacement be built. The Erie Bay light was lit in November 1818. It was a twenty-foot high square stone tower. The light had a serious design flaw. It was erected on unstable ground and over time it began to settle at a dangerous angle. In spite of this problem, it did remain in service longer than the first Buffalo light. It was not replaced until 1858.³⁵

By the time the first two Lake Erie Lighthouses were constructed in 1818, there were more than twenty commercial vessels operating out of makeshift ports on the U.S. shore line. That year the first steam powered vessel was launched on the upper lakes. *Walk-in-the-Water* was a 138-foot long craft with huge paddlewheels mounted amid ship. In her three years in service she proved very successful. Yet in 1821 the hazards of early lake navigation claimed her. As she neared the end of a trip from Detroit to Black Rock, New York, *Walk-in-the-Water* was beset by a gale. In vain her master looked for the beacon from the Buffalo lighthouse by which he might have been able to guide the vessel into the safety of Buffalo Creek. Instead, they were driven by the waves upon the beach in front of the lighthouse. The crew was able to bring off all eighteen passengers without the loss of a life. The nearby keeper's house with its large fireplace provided a needed refuge for the drenched survivors. Before the storm

34J.B. Mansfield, *History of the Great Lakes*, vol. 1, (Chicago: J.H. Beers, 1899), 364; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia* (Erin, Ontario: Boston Mills Press, 2011), 91, 101; Robert D. Ilisevich, *Daniel Dobbins Frontier Merchant* (Erie, Penn.: Erie Historical Society, 1993), 1-25.

abated, however, the pioneering steamboat was mortally damaged. The first Great Lakes lighthouse had not proven of good service to the ship, but at least it proved useful to the survivors. In short order the steam engine was removed from the wrecked vessel and installed in a second steamer—the *Superior*. In 1824 a sister ship, the *Henry Clay*, was constructed and between them the two vessels offered regular service to the burgeoning ports of Lake Erie.³⁶



J.B. Mansfield, *History of the Great Lakes* (1899), 601.

Figure 1. The wreck of the steamer *Walk-in-the-Water* with the poorly sited Buffalo Lighthouse in the background.

A third Lake Erie lighthouse was added in 1821 on a peninsula jutting into Sandusky Bay. The fifty-foot tower and its whale oil lamps were designed to help ships locate the superb shelter afforded by the bay amid the islands and points that would otherwise obscure its mouth. The structure is usually referred to as the Marblehead Lighthouse because of the later addition of other beacons for Sandusky Bay. It takes its name from the peninsula upon which it sits and from which its limestone was quarried. This lighthouse has proven one of the most durable American navigational aids, and it is the oldest beacon in continuous operation on the Great Lakes.³⁷

Lake Ontario, which was closer to the settled parts of the Union, was the busiest of the Great Lakes. It attracted more shipping in the years before 1812 than the other four lakes combined. In the wake of the war with Great Britain, Ontario also experienced a boom in navigation. It was upon its waters that the first two Great Lakes steamboats operated, the *Ontario* on the United States side of the lake and the *Frontenac* on the British side. Both were in operation by 1817. The early steamboats on the Great Lakes were among the first such vessels to see regular service on open water. Before this time steam vessels were seen as practical only as harbor ferries or river boats. The *Ontario* was actually disabled on its maiden voyage by the swells of the open lake that lifted the paddle-wheel shaft out of position. The *Walk-in-the-Water's* ability to maintain a schedule and turn a hefty profit demonstrated that steam power was well-suited for the Great Lakes and other open waters.³⁸

Lake Ontario received its first lighthouse shortly after the pioneering beacons on Lake Erie went into service. The first light beacon location was Galloo Island near Sackets Harbor, the leading shipbuilding port on the lake. A series of rocky reefs make the waters around the island a hazard to ships either

³⁶ James Cooke Mills, *Our Inland Seas: Their Shipping & Commerce for Three Centuries* (Chicago: McClurg, 1910), 89-100.

³⁷ Larry and Patricia Wright, *Great Lakes Lighthouses Encyclopedia*, 113.

³⁸ Mills, *Our Inland Seas*, 100-8.

heading for Sackets Harbor or for the entrance to the St. Lawrence River. Oswego, New York, received its first lighthouse two years later in 1822. The twenty-foot tower was erected at the mouth of the Oswego River near the United States Army fort. In 1822 on a bluff at Charlotte, New York, where the Genesee River enters the lake, one of the most longlasting lighthouses on the inland seas was erected. The twenty-two foot, octagonal limestone tower replaced a pair of makeshift lanterns that locals had hung to guide ships. Two years later Congress approved a lighthouse for Sodus Bay where a small port had developed just before the War of 1812 and where a Shaker community had taken root. A forty-foot tower of split stone served mariners until 1871 when it was replaced by new tower.³⁹

Lake Huron received its first navigation aid in 1825 when a thirty-two foot tower was erected near the site of a United States Army garrison—Fort Gratiot. The site was a crucial one for it marked the place at the southern end of Lake Huron where navigators had to adjust to the narrow confines and swift flowing water of the St. Clair River. The contract for building the structure was originally given to a Washington, D.C. favorite Winslow Lewis, who farmed it out to a subcontractor with little concern for the quality of the construction. As a result both the tower and the keeper's house were in the words of an officer from the fort, "a miserable piece of workmanship." The foundation was inadequate, the mortar and stone were inferior, the tower was too low for vessels to see, and the site was poorly selected on land subject to flooding and erosion. After just three years the tower collapsed. A new properly built structure was erected in 1829. The same year that construction began on the first Fort Gratiot lighthouse a second Lake Huron beacon was erected at the far northern end of the lake, at Bois Blanc. The initial sixty-five foot tower was almost as poorly sited and built as the Fort Gratiot light. In 1837, only eight years after it was first lit, the light tower collapsed. Safe navigation, however, required an aid at this location that marked the eastern entrance to the Straits of Mackinac, the focus of commerce on the Upper Great Lakes. A replacement was operational by 1838.⁴⁰

The first lighthouse on Lake Michigan was not erected until 1831, and it suffered from the same shabby design and construction as had bedeviled the pioneer beacons on Lakes Erie and Huron. The site selected was Chicago where steams flowing into the Mississippi River system were only a few miles inland. The site was, therefore, a magnet for fur traders and emigrating agriculturalists. Although there was no harbor, lake vessels were bringing between ten-thousand and twenty-thousand new people to the site every year. Finally, Congress approved a \$5,000 appropriation for a lighthouse. The site selected was a lot owned by the government adjacent to the Fort Dearborn army base and near the mouth of the Chicago River. Not for the first or last time in Chicago history, an inept contractor was selected for the job and the tower collapsed only minutes after it had been inspected and approved as finished. A second lighthouse rose near the same place in 1832 and fortunately it proved more durable. The port-towns of St. Joseph, Michigan, (1832) and Michigan City, Indiana, (1837) also received early

³⁹ Todd R. Berger, *Lighthouses of the Great Lakes* (Minneapolis: Voyageur Press, 2002), 26; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 21, 34.

⁴⁰ Charles K. Hyde, *The Northern Lights: Lighthouses of the Upper Great Lakes* (Lansing, Mich.: Two Peninsula Press, 1986), 80-81, 98; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 161, 166-67,

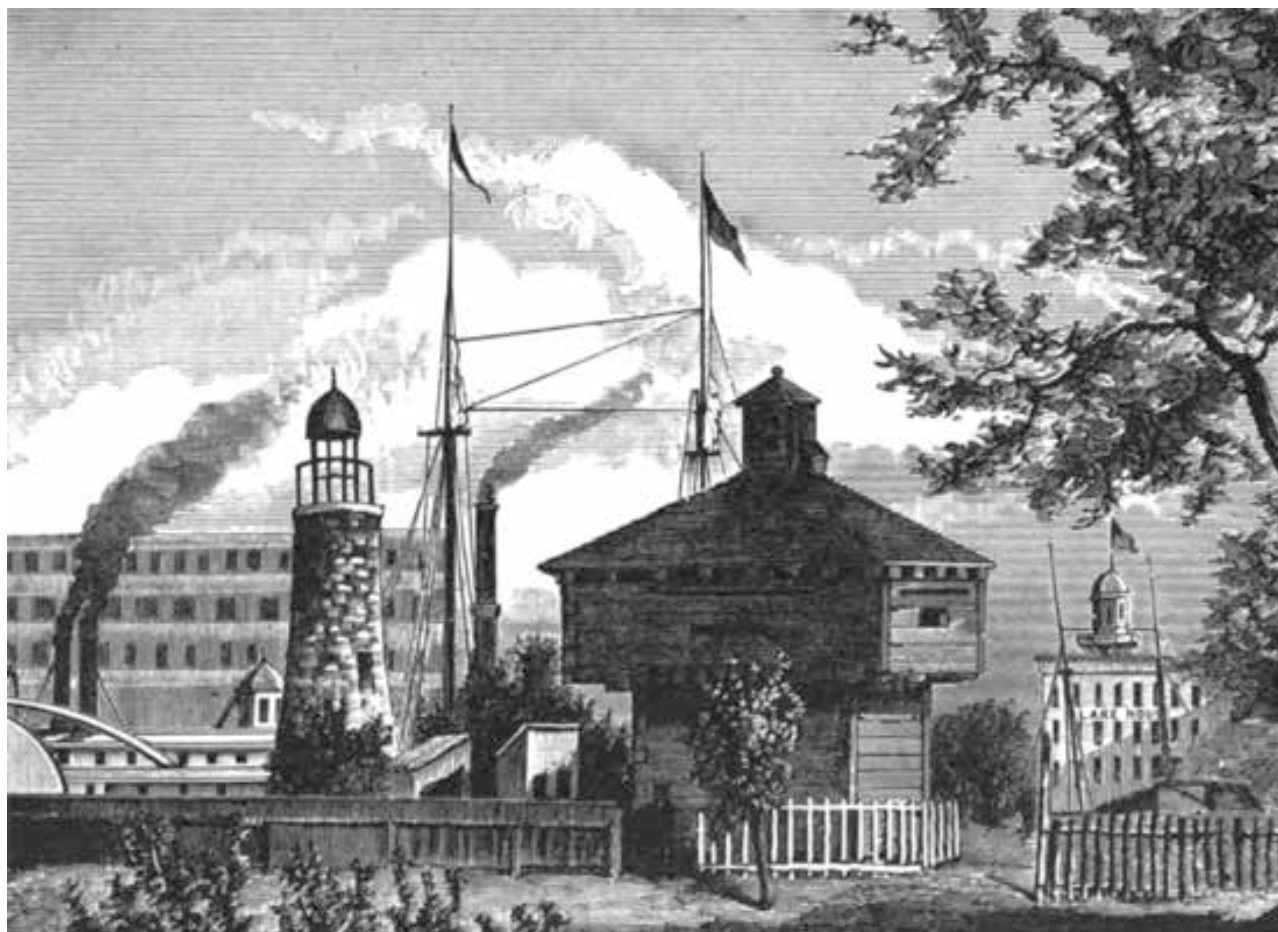


Figure 2. Chicago Harbor Lighthouse adjacent to Fort Dearborn.

lighthouses. It was not until 1839 that a lighthouse was placed within the critical Manitou Passage—the route followed by most ships destined for Chicago, Michigan, or Indiana ports. In that year a rather poorly designed lighthouse with a squat wooden tower was built to mark the southern entrance to the passage and the site of South Manitou Island's Crescent Bay—the finest natural harbor on Lake Michigan.⁴¹

Lighthouses reached Lake Superior much later than the sister lakes to the south. The falls at Sault Ste. Marie inhibited either sail or steam navigation on its cold waters. It took the development of copper mining in the region of the Keweenaw Peninsula and on Isle Royale to catch the attention of Congress. The first five lighthouses built on Lake Superior were designed to facilitate navigation to and from the copper mines. In 1842 the Ojibwe were pressured into ceding their title to much of the Upper Peninsula of Michigan. Prospectors flocked to the region based on reports by Michigan state geologist Douglas Houghton that the region was rich in mineral resources. Commercial copper mining began in 1843 and within a year a boom was in progress. Ships were the only way to reach the mines and the only way to move copper to the market. However, there were only two such vessels and

⁴¹Joanne Grossman and Theodore J. Karamanski, editors, *Historic Lighthouses and Navigational Aids of the Illinois Shore of Lake Michigan* (Chicago: Chicago Maritime Society, 1989), 3; Alfred T. Andreas, *A History of Chicago*, Vol. 1, (Chicago: A.T. Andres Publisher, 1884), 239; Hyde, *Northern Lights*, 112.

one of them, the *John Jacob Astor*, was wrecked in a storm at Copper Harbor in 1844. In 1847 Congress appropriated funds for two lighthouses on the lake, one at Copper Harbor another at Whitefish Point. Yet when renowned journalist Horace Greeley made a trip to the region in 1848, the lights still were not built. Traveling on a steamer recently portaged around the falls he was horrified by the navigational dangers on the lake. In an editorial in the *New York Tribune*, he complained:

On the whole lake there is not a lighthouse nor any harbor other than such holes in the rock-bound coast as nature has perforated. Not a dollar has been spent on them. Congress has ordered a lighthouse to be erected at Whitefish Point and has provided the means; a Commissioner has located it; every month's delay is virtual manslaughter; yet the executive pays men to air uniforms at the Sault [Army garrison Fort Brady] in absurd uselessness, and leaves the lighthouse until another season.

In 1849 the lighthouse was completed at Copper Harbor at the tip of the Keweenaw Peninsula and near the heart of the early mines. That same year a lighthouse was finally constructed near Whitefish Bay at the eastern end of Lake Superior. This area would eventually be known as the “graveyard of Lake Superior” or the “shipwreck coast.” By 1848 it had already earned a reputation as a dangerous stretch of water because of the fierce north winds that whipped up waves from across the entire expanse of the lake and lashed the shores of the bay. Like many of the first lighthouses built on the other lakes, these two early Superior beacons were not long in use due to construction inadequacies or problems with siting.⁴²

The expansion of lighthouses along the Great Lakes reflected a national commitment to the development of that inland maritime frontier. Unfortunately, the administration of U.S. lighthouse expansion was deeply flawed. While the first lighthouses built by the new republic on the Atlantic seaboard received the highest level of close scrutiny with Alexander Hamilton, Secretary of the Treasury—himself reviewing plans for the site and the design of the tower—early Great Lakes lighthouses were left to the administration of a small and incompetent bureaucracy.

Early Lighthouse Administration and Design

To be sure, geography played a role in the failure of many of the early Great Lakes lighthouses. The region around Lakes Erie, Huron, and Michigan was sparsely inhabited in the 1820s, and Superior was beyond the pale of settlement well into the 1840s. Skilled artisans were rare and supplies always a problem. Responsibility for carrying out Congressional authorization for lighthouses rested with the Lighthouse Bureau of the Treasury Department. Stephen Pleasonton, the Fifth Auditor of the Treasury, functioned as the General Superintendent of Lights. He was not a maritime man nor did he have any engineering expertise. He was a clerk and bookkeeper, and he was generally more concerned with reducing costs than paying attention to the needs of mariners. In fairness to the man, he was also charged with overseeing all accounts of the State Department and the Patent Office. When

⁴² Larry Lankton, *Beyond the Boundaries: Life and Landscape at the Lake Superior Copper Mines, 1840-1875* (New York: Oxford University Press, 1997), 7-14; Terry Pepper, “Seeing the Light: Whitefish Point,” <http://terrypepper.com/lights/superior/whitefish/whitefish.htm>, accessed, October 2014; Hyde, *Northern Lights*, 176; Jane C. Busch, *Copper Country Survey Final Report and Historic Preservation Plan* (Houghton, MI: Keweenaw National Historical Park Advisory Commission, 2013), 80-86; The original keeper's dwelling from the 1849 Copper Harbor lighthouse still stands. As of 2015 nineteen light stations established in the copper country remain extant.

Congress legislated for a new lighthouse, Pleasanton's bureau let the contract, set the budget, and usually provided some type of specifications, seemingly in the form of a drawing. Of course, the actual construction took place far from the seat of government. Eventually Pleasanton directed that local collectors of customs take responsibility for supervising the building of new lighthouses. While that would be fine in Boston Harbor or Chesapeake Bay, there were few treasury agents on the remote Great Lakes frontier. Hence, in many cases, there was no supervision of the contractor's work at the site.⁴³

Over and above shoddy construction, there were serious design flaws with early Great Lakes lighthouses that became apparent within a decade of their construction—if not sooner. The individual beside Pleasanton who deserves blame for the construction problems was his friend and associate Winslow Lewis. Unlike the Treasury auditor, Lewis was an experienced mariner, a point he emphasized by styling himself “Captain Lewis.” He had the New England Yankee gift for practical invention and during the first decade of the nineteenth century, he experimented with creating a new lighting system for navigational aids. He sought to adapt a type of oil lamp invented in France for domestic use for use in U.S. lighthouses. In 1812 Congress was impressed enough with what he came up with to purchase his patent rights and contracted with him to place his lights in all existing American lighthouses. Not content with this accomplishment, the enterprising Lewis then snared a contract to supply all coastal lighthouses with whale oil for the new lights and to inspect each one on an annual basis. Pleasanton extended Lewis's hold over U.S. lighthouses even further in 1820 by awarding Lewis a large percentage of the contracts for building new lighthouses. He quickly sub contracted out most of these jobs, pocketing a fine profit and giving little thought to the resulting lighthouse. Lewis was awarded the original contract for the miserably built Fort Gratiot lighthouse on Lake Huron, which had to be replaced after a mere four years in service.⁴⁴

Winslow Lewis's poorly built light towers were only a small part of the problems he caused the Lighthouse Bureau. Every lighthouse was outfitted with his lamp. The basic design of the lamp was sound, in large part because it was the work of Frenchman Francois-Pierre Ami Argand and was widely used in European lighthouses. Lewis's design suffered because of the inadequate design of the reflectors that were needed to amplify the light. In Europe, the French and English used what were



Library of Congress, LC-USZ6-587

Figure 3. Stephen Pleasanton Fifth Auditor of the United States and head of U.S. Lighthouse Administration, 1820-1851.

43 F.Ross Holland, Jr., *America's Lighthouses: An Illustrated History* (Brattleboro, Vt: Greene Press, 1972), 27-29.

44 Amy K. Marshall, *Frequently Close to the Point of Peril: A History of Buoys and Tenders in U.S. Coastal Waters, 1789-1939*, (M.A. Thesis, East Carolina University, 1997), 10-11; Holland, *American Lighthouses*, 29.

called parabolic reflectors. Lewis saw one of these in use at Hollyhead in England and then attempted to copy the design. In spite of the lack of true originality in his design he was awarded a federal patent. The trouble from a navigation point of view came when he had to produce the reflectors for a large number of lighthouses. The key to a parabolic form is that it must be curved inward in such a way as to focus the light source to maximum effect. Lewis could not produce reflectors of the proper shape. Critics of his system complained the reflectors had a “wash basin” shape, unlike a parabolic form (such as a modern satellite dish) and, hence, American lighthouses projected a very weak beam. Lewis’s reflectors were made even worse because of the thin sheets of metal he used, which became misshapen over time, and his stingy veneer of sliver would quickly wear off. Sailors who visited European waters noted the difference and complaints by the hundreds were sent to Congress. Yet no action was taken.⁴⁵

Lewis’s inferior lighting system was the standard in American lighthouses for forty years, in part because of his cozy relationship with auditor Pleasonton. The basic inattention to proper engineering was also seen in the height of light towers erected during the first half of the nineteenth-century. In Europe, where the input of both engineers and mariners was incorporated into the design, it was noted that on coastlines with a high elevation a lighthouse need not be very tall since topography made the light visible from far out to sea. Where the coast line was low lying, however, as it was along so much of the Great Lakes shore, it was essential to build tall light towers to ensure that ships could see the light from a considerable distance. In 1810, for example, the British erected the Bell Rock Lighthouse. It was an impressive feat of engineering for the day not least because it was erected on rocks just below the surface of the North Sea. Since the lighthouse was built at sea level, engineer Robert Stevenson built the tower 115 feet high. This ensured that mariners could see the light from as much as thirty-five miles away. The light tower Winslow Lewis designed at Fort Gratiot was sited only a few feet above water level, but the tower he built was only thirty-two feet high. America’s first two Great Lakes lighthouses were even shorter. The original Buffalo lighthouse was only thirty-feet high while the Erie light was likely only twenty-feet in height. These short comings all but ensured that early Great Lakes lighthouses were inadequate to meet the needs of lake commerce and would have to be replaced with new construction in short order.⁴⁶

Even the short towers built in the 1820s and 1830s were an engineering challenge. Most early lights marked immediate navigational concerns like harbor entrances and reefs.⁴⁷ While some lights were stand-alone wood towers, or wood towers attached or integral to a keeper’s quarters, most of the early light towers were masonry, constructed of rubble or coursed stone and later, brick.⁴⁸ The use

45 Hyde, *Northern Lights*, 17; Holland, *American Lighthouses*, 29-30.

46 Robert Browning, “Lighthouse Evolution and Typology,” United States Coast Guard Historians Office, <http://www.uscg.mil/history/web/lighthouses/LHEvolution.asp>. Accessed, October 2014; “Robert Stevenson,” *Encyclopedia Britannica*, (1911), Vol. 25, http://en.wikisource.org/wiki/1911_Encyclop%C3%A6dia_Britannica/Stevenson,_Robert, accessed October 2014; Holland, *American Lighthouses*, 18-19.

47 Brian J. Faltinson, “Split Rock Light Station” National Historic Landmark Nomination (2009), 28

48 The masonry tower is one of the most prolific; it is estimated that 52% of all extant lighthouses in the United States are this type. See Candace Clifford, editor, “Light Stations of the United States” Multiple Property Documentation Form, December 2, 2002, 15, citing Robert L. Scheina, “The Evolution of the Lighthouse Tower,” in *U.S. Lighthouse Service Bicentennial, a U.S. Lighthouse Society Event Souvenir Program* (Newport, Rhode Island, September 21-24, 1999) p. 18; and Candace Clifford, *1994 Inventory of Historic Light Stations* (Washington, D.C.: Government Printing Office for the National Park Service, 1994).

of such a heavy material for a tall, narrow structure required two essential design features. The first was a firm foundation. This was essential to support the massive weight of the tower. Pleasonton usually issued specifications that called for a firm foundation; however, too often contractors chose sites that were close to the water on ground that was soft. The 1818 lighthouse at Erie was built on an elliptical foundation of crushed stone, mortar, and lime that was about four feet thick. The foundation proved totally inadequate, particularly after it was discovered that quicksand lay beneath it. As a result, the structure began to settle at a dangerous angle, which necessitated the construction of a new tower. The Fort Gratiot lighthouse, which eventually collapsed, was built on soft ground with only a log foundation. The foundation was highly important because of the second requirement of early lighthouse design, thick walls. These early masonry towers were typically built in the form of a frustum, a shape created by cutting off the top portion of a cone shaped structure.⁴⁹ This addressed the structural issue of increased weight pressing down upon the lower walls, as height increased. Therefore, the lower walls had to be thicker in order to bear the burden. The Marblehead lighthouse on Lake Erie, the oldest such structure on the lakes and one of the few from the 1820s that was well-built, is twenty-five feet in diameter at its base with walls five feet thick. The foundation stands upon solid limestone. The tower tapers upward to a diameter of twelve-feet with walls two-feet thick. Another important factor in construction was the quality of the mortar that was used. A lack of care in the mixing or the use of an improper binding agent would lead to a mortar that would not weather well and in time cause the stone walls to crack and separate, which was another of the faults that brought about the demise of the first Fort Gratiot Lighthouse.⁵⁰

The early Great Lakes lighthouses were almost all fueled by whale oil, preferably sperm whale oil. There was a notable experiment with a fuel source that was produced in the Great Lakes region. In 1829 a new lighthouse was lit at Barcelona, New York, a small port on Lake Erie between Buffalo and Erie, Pennsylvania. The durable fieldstone tower that was built there and still stands today was originally lit by whale oil. However, in 1830 William Hart, a local entrepreneur and inventor, persuaded Pleasonton to have the beacon fueled by natural gas. This was an era when buildings across the country were lit by candles or whale oil lamps, but Hart had earlier tapped natural gas deposits around nearby Fredonia, New York, and used them to light the streets and homes of that community. He found a natural gas spring about three-quarters of a mile from the lighthouse, capped it, and ran a pipe to the navigational aid. The light keeper was impressed by the result. He reported that “as a light for a lighthouse it exceeds, both in quantity and in brilliancy, anything of the kind I ever saw.” The Barcelona lighthouse had the honor of being the first public building in the United States to be lit by natural gas. Unfortunately, the gas supply tapped by Hart was rather small and like all gas deposits it was destined to be exhausted. This happened in 1838 and the lighthouse was returned to whale oil. The harbor also proved short-lived. The town went into steep decline in the 1840s and the lighthouse

⁴⁹ Clifford, 15.

⁵⁰ Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 101, 166-67, 355.

was abandoned in 1859 and sold to private owners in 1872. Natural gas was never again tried as a fuel source for Great Lakes lighthouses.⁵¹

Life at Frontier Lighthouses

The first lighthouse keepers on the Great Lakes often manned stations on the nation's far frontier fringe. Of course, from the eighteenth century into the twentieth century a remote and isolated location has fed the romantic image of life at a light station. Yet some of the first Great Lakes lighthouses were not only set in topographically remote locations but in borderland situations where even national sovereignty was in question. The Fort Gratiot Lighthouse was erected only a decade after the War of 1812 in a region solely inhabited by Anishinaabe (Ojibwe and Odawa) who had fought fiercely to protect their homelands from U.S. control. The Bois Blanc Lighthouse at the northern extremity of Lake Huron was built in 1829, and it was the only evidence of U.S. sovereignty in the region between Mackinac Island and Fort Gratiot a distance of more than two-hundred miles. Lighthouse keepers had to be exceptionally resourceful and independent.

Eber Ward, the brother of the shipping entrepreneur discussed at the start of this chapter, was named the first keeper of the Bois Blanc lighthouse. For three years he lived there with his son who helped him tend the light. Every month or so, a ship would stop by the lighthouse with their mail, and occasionally a re-supply of lamp oil. Most of their time was spent harvesting wood for heating and cooking, which they brought to the site by dog sled. In summer and fall they ensured their food source by catching and salting barrels of whitefish and trout. A small library of historical and scientific books allowed Ward to tutor his son. Ward tended the Bois Blanc beacon for eight years without ever being absent from his post for a night. When his son left the island to begin a life as a mariner, Ward was joined by a daughter. It was Emily Ward in 1837 who rescued the station's lamps and reflectors when a storm battered the poorly built and positioned tower. As cracks formed in the structure, she risked her life making several trips up to the top and finished her work only moments before the structure toppled into the lake.⁵²

Typical of the image of bleak isolation summoned up by early Great Lakes lights is an 1840 account of the Thunder Bay lighthouse. That year the businessman Frederick J. Starin of Montgomery County, New York, went west on the steamboat *Constellation*. One spring evening as the shadows began to fall on the lighthouse at Thunder Bay Island Starin disembarked long enough to inspect the lighthouse. Ten years before Congress had authorized a light be placed here. The rubble stone tower was poorly constructed, and the keeper had to fight a solitary battle using his own funds to keep it upright. Starin apprised the stark, wind-swept scene. The station included only a conical tower, a dwelling, and a few acres of cleared ground, presumably a garden. "The rest of it," he wrote, "is one dense forest, and really

⁵¹ Todd R. Berger, *Lighthouses of the Great Lakes* (Stillwater, MN: Voyageur Press, 2002), 27. There were experiments with the use of coal gas at several Atlantic Coast lighthouses but these proved unsustainable.

⁵² Eber Ward, "Incidents In The Life Of Mr. Eber Ward, Father of Capt. E. B. Ward of Steamboat Fame As Related To Mrs. E. M.S. Stewart in The Summer Of 1852" in *Michigan Pioneer & Historical Society, Pioneer Collections*, Vol. 6, (1884): 471-73; Bernard C. Korn, *Eber Brock Ward: Pathfinder of American Industry*, (Ph.D. Dissertation, Marquette University, 1942), 50-53.

a bleak, lonely, desolate place.” For the next twenty years the same could be said for the entire coast of Lake Huron north of Saginaw Bay.⁵³

The first lighthouse keepers on the Great Lakes came from a wide range of backgrounds. Ward had been a farmer, a logger, an Indian trader, and was experienced in small boat navigation. His experience in coping with frontier conditions was in stark contrast to George McDougall, the first official keeper at Fort Gratiot. McDougall was an attorney whose only qualification for the job was his political connections. Overweight and in poor health, he seems to have thought the posting would be an easy sinecure with a secure annual salary. When he found that the job would entail repeated trips up to the top of the tower to trim the lamps, refill the oil, and clean the reflectors, he hired a man to do that part of the job, while he used his connections to supplement his income with an additional federal office, customs collector. Other early keepers won their positions by their past services to the government. The first keeper at the Marblehead Lighthouse on Lake Erie was a Revolutionary War veteran who had settled nearby. After nine years on the job, he died in the cholera epidemic that swept the West in 1832. His wife, Rachel Miller Walcott, who had already been helping with the duties of keeper was awarded the post in her own right. She became the first female keeper on the Great Lakes. The Barcelona Lighthouse on Lake Erie was originally staffed by a local minister. Sometimes even men with actual maritime experience were named to the post such as Captain John Bone at Erie lighthouse.⁵⁴

The Erie Canal

No single event, no invention, or innovation had as significant an impact on the Great Lakes region as the building of the Erie Canal. At the start of the decade of the 1820s the Great Lakes were part of a far northwest frontier. They were important to the nation because they were an area vulnerable to foreign or American Indian threat but peripheral to the main thrust of the United States economy. Westward settlement, save for Ohio’s Western Reserve lands that lured Connecticut Yankees to Lake Erie, largely accelerated into the Ohio and Mississippi Valley and lands drained by their tributary waters. Emigrants crossed over the Appalachian Mountains in Conestoga wagons to Pittsburgh where they could purchase a flatboat to float down the Ohio River to new lands in the southern portions of Ohio, Indiana, Illinois, and the newly admitted state of Missouri. In each of these states, settlement was concentrated along the rivers. Families from the upland South followed the Tennessee and Cumberland Rivers into the western country. They brought to the new states of the West the individualism, cultural attitudes, political orientation, and in some cases the social institutions of the South. Northern Illinois and Indiana, far Michigan and Wisconsin were the domain of American Indians and fur traders. These areas had the image of being remote and that remoteness made them unappealing to a people anxious to get ahead economically. Folklore tells of what happened when

⁵³ Frederick J. Starin, “Diary of a Journey to Wisconsin in 1840,” *Wisconsin Magazine of History*, Vol. VI, No. 1, (1922), 78-9.

⁵⁴ Eber Ward, “Incidents in the Life,” 471-73; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 166-67; *Commemorative and Biographical Record of the Upper Lake Region* (Chicago: J.H. Beers, 1905), 203.

the town of Chicago on Lake Michigan's cold shores tried to sell bonds to the Shawnee Town Bank, Illinois's first chartered bank housed in an imposing Greek revival stone edifice in far southern Illinois. The bank's officers sent their northern brothers packing with the taunt that no place so far removed from the Ohio River could ever amount to anything.⁵⁵

The Ohio and Mississippi Valley were the loci of western expansion because their waters provided the means to receive manufactured goods and to ship agricultural harvests. Euro-American pioneers may have been willing to abandon settled homes and endure the trials of building new farms and businesses in the West, but most wanted more than a subsistence life style. They sought a chance to prosper. To do so they had to be able to market the products of their labor. For western farmers that meant having an affordable means of shipping agricultural produce to markets that would pay a good price. In 1800 it cost \$100 to ship a ton of grain by wagon over land for three-hundred miles. A single barrel of flour cost \$2 to ship one hundred miles, while the cost of water transport would be a mere twenty-five cents. At best a loaded wagon could make a mere twenty miles a day. This meant that the time and costs for overland transportation were prohibitive, particularly for such high volume products as corn or wheat. The development of steamboats on Western waters made the rivers all the more vital as the conduit of commerce and soon the decks of these vessels were stacked high with sacks of grain. Pittsburgh, Cincinnati, and Louisville became the great ports on the Ohio River, while St. Louis, where the Missouri, Mississippi, and Ohio Rivers join together, became a major trans-shipment center. New Orleans, at the great river's mouth, thrived as the outlet to the sea.⁵⁶

In 1817 construction began on a canal that would unite the Hudson River with Lake Erie. The goal was to force a water route west from New York City where nature had never intended. Yet if the Empire State and city were to grow with the nation, a connection with the West was required. Thomas Jefferson, the inventor and spinner of western dreams, pronounced the idea of building the world's longest artificial waterway "little short of madness." His successor, James Madison, vetoed a bill that would have provided partial federal funding for the canal. The mammoth project became New York's and New York's alone. Although the cost was estimated to be more than \$20,000 per mile, the state raised the \$7 million necessary for construction. The undertaking was by far the New World's most ambitious engineering project. A difference of five-hundred feet of elevation separated the Hudson River and Lake Erie. This meant building eighty-three separate locks to lift the boats up and down as needed. Nonetheless, the work was conducted expeditiously and the canal was finished in 1825 with its official opening in 1826.⁵⁷

Within two years of the Canal's completion a revolution in western settlement was underway. Hundreds of families from New England and New York took passage on the canal boats to Buffalo

55 James E. Davis, *Frontier Illinois* (Bloomington: Indiana University Press, 1998), 125-23; John Drury, *Old Illinois Houses* (Chicago: University of Chicago Press, 1977), 13-14.

56 Mansfield, *History of the Great Lakes*, Vol.1, 186; Carol Sheriff, *The Artificial River: The Erie Canal and the Paradox of Progress, 1817-1862* (New York: Hill & Wang, 1996), 181.

36 57 Ronald E. Shaw, *Erie Waters West: A History of the Erie Canal* (Lexington: University of Kentucky Press, 1966), 57, 87, 192.

and from there on schooners and steamboats headed for the upper lakes. Unlike the solitary movement of a family from the southern back country to the Ohio River frontier, the Yankee emigrants came in large groups often settling as a community on the Illinois prairie or in the valleys of Michigan. They brought with them a way of life centered on Congregational churches, wheat farming, township government, and public education. On the canals and ships, they often encountered European immigrants from the Low Countries, the German states, or



Figure 4. *The Erie Canal at Lockport, NY. Engraving made from 1839 painting by W.H. Bartlett.*

Scandinavia, many of whom also traveled in multifamily groups that helped the newcomers overcome the intimidation of an alien geography and language. These large parties of pioneers usually had a specific destination already scouted out by an advance guard. Timothy Flint, the roving New England minister, observed this migration. In the wake of the canal “more than half of the whole number of immigrants now arrive in the West by water. This remark applies to nine-tenths of those that come from Europe and the northern states.” A federal official traveling the canal in 1827 was amazed by the surge of people and economic activity along the waterway. “It is not possible for me to convey any adequate idea of the wealth which floats upon the canal; nor the advantages which are experienced from it by the people who live upon its borders, and those more remote settlements throughout the entire region of the north-west.”⁵⁸

The opening of the Erie Canal was followed by a boom in lake shipping. Prior to the canal, Lake Michigan commerce was estimated “not to exceed the cargo of five or six schooners.” Lake Erie was only slightly busier with only forty commercial vessels. By 1833 a traveler noted that Lake Erie was a “sea of busy commerce.” The amount of tonnage devoted to shipping increased from a few thousand tons before the canal to 24,045 tons in 1836 and 29,995 tons just a year later. Steamers carried a large percentage of the migrating farmers, while schooners brought to Buffalo the golden grain harvest of the West. A skeptical Scottish traveler in 1833 was shocked by the way vessels were “literally crammed” with people and possessions “steers, cows, horses, wagons—in short we were like the followers of an

⁵⁸ Timothy Flint, *The History and Geography of the Mississippi Valley* (Cincinnati: E.H. Flint and L.R. Lincoln, 1832), 184-85; James E. Davis, *Frontier America, 1800-1840: A Comparative Demographic Analysis of the Frontier Process* (Glendale, Calif.: Arthur Clark Company, 1977), 46-47; Howe, *What God Hath Wrought*, 137-39; Thomas McKenney, *Sketches of a Tour of the Lakes* (Baltimore: Fielding Lucas, 1827), 59.

invading army, and every one building castles in the air.” The uncomfortable Scot did not appreciate that a new waterborne frontier was created with schooners playing the part of the storied covered wagon of western myth. Instead, throughout the 1830s, sailing ships dropped anchor at river mouths all along the Michigan and Wisconsin shores. Livestock was thrown overboard to swim ashore while husbands and crew members waded to land with wives or children carefully balanced upon their shoulders. If the vessel had a small boat or captain’s yawl, a more dignified landing could be afforded the women. What is clear from the manner in which towns were founded like Racine and Milwaukee in Wisconsin or St. Joseph and Grand Haven in Michigan, is that it was ships that carried the settlers hundreds of miles into the wilderness, and it was ships that gave them the commercial connection to the outside world that allowed them first to survive and then to thrive.⁵⁹

The Yankee and northern European settlers who flocked to the West via the Erie Canal brought with them what some historians have called “a culture of progress.” This notion was a fusion of the Republicanism of the American Revolution, the religious legacy of Puritan New England, and the personal ambition of a people unfettered by Old World traditions. This vision manifested itself in the belief that they had a responsibility to improve the world—that could mean attacking social problems or reshaping the physical world. “Where God left gaps in the Appalachian Mountains,” historian Carol Sheriff has written, “He intended humans to create their own rivers.” Making the world a more prosperous place for themselves and their fellow citizens was the responsibility of virtuous Republicans. Where the task was too great for an individual, then it should fall to the government for the commonweal. These ideals, validated by the fantastic success of the Erie Canal, became deeply rooted in the political attitudes of the people taking ships to new homes in the Great Lakes states. It was the root of a conflict that would grow between the South and the new Northwest over the proper role of government in American economic development.⁶⁰

What some people regarded as a “culture of progress” could look to others as crass avarice. Margaret Fuller, a gifted writer and literary critic, was herself a daughter of New England, yet she lamented the spirit of acquisitiveness that dominated her fellow citizens. In 1843 she took passage on a steamer from Buffalo to Chicago. “The people on the boat were almost all New Englanders, seeking their fortunes.” As she got to know her fellow passengers, she was struck by the degree to which they were motivated by material gain and seemed not to appreciate the history-making adventure before them. “It grieved me to hear these immigrants, who were to be fathers of a new race, all, from the old man down to the little girl, talking not of what they should do, but of what they should get in the new scene.” She lamented; “It was to them a prospect, not of unfolding nobler energies, but of more ease and larger accumulation.” This was the negative stereotype of the “Yankee” and one that would later

59 William H. Keating, *Narrative of an Expedition to the Source of St. Peter’s River* (Philadelphia: H.C. Carey, 1824), 166; Kenneth E. Lewis, *West to Far Michigan: Settling the Lower Peninsula, 1815-1860* (East Lansing: Michigan State University Press, 2002), 222-25; Theodore J. Karamanski, *Schooner Passage: Sailing Ships and the Lake Michigan Frontier* (Detroit: Wayne State University Press, 2000), 44-46; Richard Weston quoted in Catherine Cangany, *Frontier Seaport: Detroit its Transformation into an Atlantic Entrepot* (Chicago: University of Chicago Press: 2014), 201.

loom large in the sectional conflict.⁶¹

A Safe Harbor: Federal Support for Great Lakes Settlement

The Erie Canal was an outstanding example of what government action, in that case state government action, could do to stimulate economic activity in the largely undeveloped interior of the new United States. It was, however, by no means the first such intervention. More than perhaps any other region of the country the Great Lakes region had been the beneficiary of publicly supported, particularly federally supported, development. These actions took the form of critical interventions in the realm of military, diplomatic, economic, and navigational affairs.

When George Washington was sworn in as the first president under the 1789 constitution, the most daunting of his many challenges lay along the Great Lakes frontier. Not only was this area illegally occupied by the military forces of Great Britain, those foreign troops supported the independence of a powerful alliance of Great Lakes American and Canadian tribes determined to oppose United States sovereignty in the region. Nor did the new republic's policy toward the Indigenous people do anything to inspire their trust. In 1791 the seriousness of this threat was demonstrated when the Indigenous alliance destroyed in battle the bulk of the United States Army. The sting of this humiliation forced Washington into a sustained commitment to win back and secure this endangered frontier. United States victory in the Battle of Fallen Timbers in 1794, Jay's Treaty with England, and the Treaty of Greenville (1795) with the American Indians removed the immediate danger and opened the way for United States military presence on the Great Lakes. Early forts were established at Detroit and Michilimackinac in 1796 and Chicago in 1803—only to be swept away by the comeback of British and American Indian forces at the start of the War of 1812. The end of that conflict led to reopening of those forts and the establishment of new garrisons at Saginaw Bay (Fort Gratiot, 1814), Green Bay (Fort Howard, 1816), and at Sault Ste. Marie on Lake Superior (Fort Brady, 1822). The primary function of these forts was to provide security for American merchants and settlers, but the garrisons did much more. As historian Francis Paul Prucha, S.J. demonstrated, they brought U.S. law into the region, stimulated the frontier economy by supporting local business, functioned as the first post offices, and undertook critical improvements to roads and communication. An example of the role that military posts played in helping to stimulate economic development can be seen in the actions of the Fort Dearborn garrison. In 1828 Major J. Fowle made the first attempt to build a harbor at the head of Lake Michigan when he ordered his men to dig a channel through the sand bar that blocked the mouth of the Chicago River. The effort led to a fifteen-foot deep passage from the lake into the protected waters of the river. Unfortunately, in this case, the improvement was only temporary as wave action shortly clogged the opening with sand once more.⁶²

The presence of military garrisons were the opening wedge into which a flood of invaders from the American settler colonial state would flow and threaten the sovereignty and survival of the

61 Margaret Fuller, *A Summer on the Lakes* (Boston: Charles Little and James Brown, 1844), 14.

62 Francis Paul Prucha, S.J., *Broadax and Bayonet: The Role of the United States Army in the Development of the Northwest, 1815-1860* (Lincoln: University of Nebraska Press, 1953), vii-xii; Patrick E. McLearn, *The Rise of the Port of Chicago to 1848*, (M.A. Thesis, University of Missouri, St. Louis, 1967), 20.

Indigenous people of the Great Lakes region. However, the ability of these native nations to work in close alliance with one another and to receive support from the British territory made them a formidable threat and had long retarded settlement in the region. It was only in the wake of the War of 1812 that military resistance ceased to be a realistic option for them. Federal officials, urged on by Euro-American settlers, forced repeated land cession treaties on the American Indians. The passage of the Indian Removal Act in 1830 by the Andrew Jackson administration made the ethnic cleansing of the area east of the Mississippi River national policy. At bayonet point the prairies and oak openings of Illinois, Indiana, and southern Michigan were cleared of American Indian peoples. This action, coming in tandem with the opening of the Erie Canal, was a powerful stimulus to the rapid spread of Euro-American farms in the region. Commerce and navigation on the lakes expanded in response to opportunities afforded to Euro-Americans by the federal government's erasure of most American Indian tribes in the region. Only the Anishinaabeg (Odawa and Ojibwe) tribes located along the northern fringe of the lakes were able to adopt strategies that allowed them to avoid removal.⁶³

The rapid occupation and commodification of the lands lost by the Indigenous people was facilitated by another critical federal government action—the rectangular system for the survey and sale of the public domain. Authorized by the Ordinance of 1785, the public land survey system cast a precise geometric grid over all the nation's western lands. This was originally conceived by Thomas Jefferson to overcome the chaos of the metes and bounds system of erratic land survey and sale. That system had left land titles compromised by overlapping claims and lengthy law suits. Jefferson wanted a system that would lay the foundation for a West inhabited by yeoman farmers who could develop their land secure from competing claims. The sale of land surveyed by the federal government would become an important source of revenue to support the government. The federal surveys started from a baseline laid down in eastern Ohio and proceeded West across all of the Great Lakes states. When the system expanded into southern Illinois and Indiana, it was no small inducement for Kentucky farmers, such as Abraham Lincoln's family, for example, to leave the uncertain land tenure of the Bluegrass State and purchase secure federal land titles. Both small farmers and rich eastern land speculators liked the new system. The latter also appreciated the orderliness of a system that allowed them to know what land they were buying, where it was, and at what price.⁶⁴

Military garrisons, American Indian removal, and an efficient land survey system all combined with the Erie Canal to stimulate an immigrant flood into the Great Lakes region. Navigational aids were a constituent part of a federal commitment to the settlement of the region. The pioneer lighthouses of the 1820s and 1830s were the first phase of the federal commitment to improve the safety and efficacy of shipping. In the wake of their construction came a chorus of requests for the construction of harbor facilities on the lakes. There are only a handful of natural harbors on the Great Lakes, and those were

63 For more on Indian removal in the region see, Ronald Satz, *American Indian Policy in the Jacksonian Era* (Norman: University of Oklahoma Press, 1975). A small band of Potawatomi under the leadership of Leopold Pokagon were also able to avoid removal in southern Michigan.

40 64 Roy M. Robbins, *Our Landed Heritage: The Public Domain, 1776-1936* (Lincoln: University of Nebraska Press, 1962), 7-8.

often far removed from the growing towns of the region. The would-be port cities of the Great Lakes tended to be founded where rivers entered the lakes. Buffalo lies on the Buffalo River. Cleveland was born at the mouth of the Cuyahoga River. Toledo was founded at the mouth of the Maumee River. Chicago is at the mouth of the Chicago River, and to the north, Milwaukee is at the mouth of the Milwaukee River. The trouble with these locations as ports was sand bars that blocked the place where the rivers meet the lake. If the sand bars could be cleared, the river mouths would make excellent harbors and the commercial prospects of each of those locations would be secured. The issue of sand bars was prevalent at scores of other smaller towns all along the lakes. Communities tried numerous ways to overcome the problem. Temporary solutions could be achieved as the Fort Dearborn garrison had done during high water conditions by simply digging a channel through the bar. However, the natural movement of sand borne by lake waves would soon rebuild the barrier. Where several feet of water flowed over the bar, other expedients were possible. One was to hitch a vessel to several teams of oxen on the shore and have them pull the ship over the bar. Similarly, a ship could have its anchor carried over the bar in a small boat and deposited in the harbor. The crew would then use the capstan to pull the vessel toward the anchor and over the bar. Frontier self-sufficiency, however, could only do so much. None of these methods were practical for regular commercial purposes and all were dependent on special and fleeting environmental conditions.⁶⁵

What was needed was engineering expertise and a considerable amount of money to fund construction, both of which were in short supply at frontier ports. Buffalo, New York, the furthest east of the nascent lake ports and closest to eastern financing led the way in harbor development. The town was locked in rivalry with Black Rock, New York, for selection as the western terminus of the Erie Canal. To beat out their rival, Buffalo citizens demonstrated considerable initiative and planned to build a pier that would prevent sand from blocking the mouth of the Buffalo River. In 1819 they were greatly helped by a loan from the State of New York. The project was completed by 1821 and Buffalo was made the canal terminus. Buffalo's bootstrap effort went forward because they could secure a loan from the state, which had a vested interest in making the Erie Canal a success. Other would-be lake ports lacked that kind of leverage and instead were reduced to sending appeals to the federal government.⁶⁶

By the early 1820s Congress was beset with appeals for help from across the country to build roads, harbors, canals, and to clear rivers of obstacles. As the Erie Canal neared completion, the idea that Thomas Jefferson had thought was "madness" began to look inspired and boosters scrambled to secure federal support for similar endeavors. Politicians argued over the constitutionality of lending federal assistance to such requests. Heirs to Thomas Jefferson's vision of a national government of narrowly constrained powers felt that such projects were unfair and unconstitutional because they took money

⁶⁵ Karamanski, *Schooner Passage*, 50-52.

⁶⁶ Thomas W. Symons and John Quintus, "History of Buffalo Harbor: Its Construction and Improvement in the Nineteenth Century," *Publications of the Buffalo Historical Society*, Vol. V, (1902), 240-60.

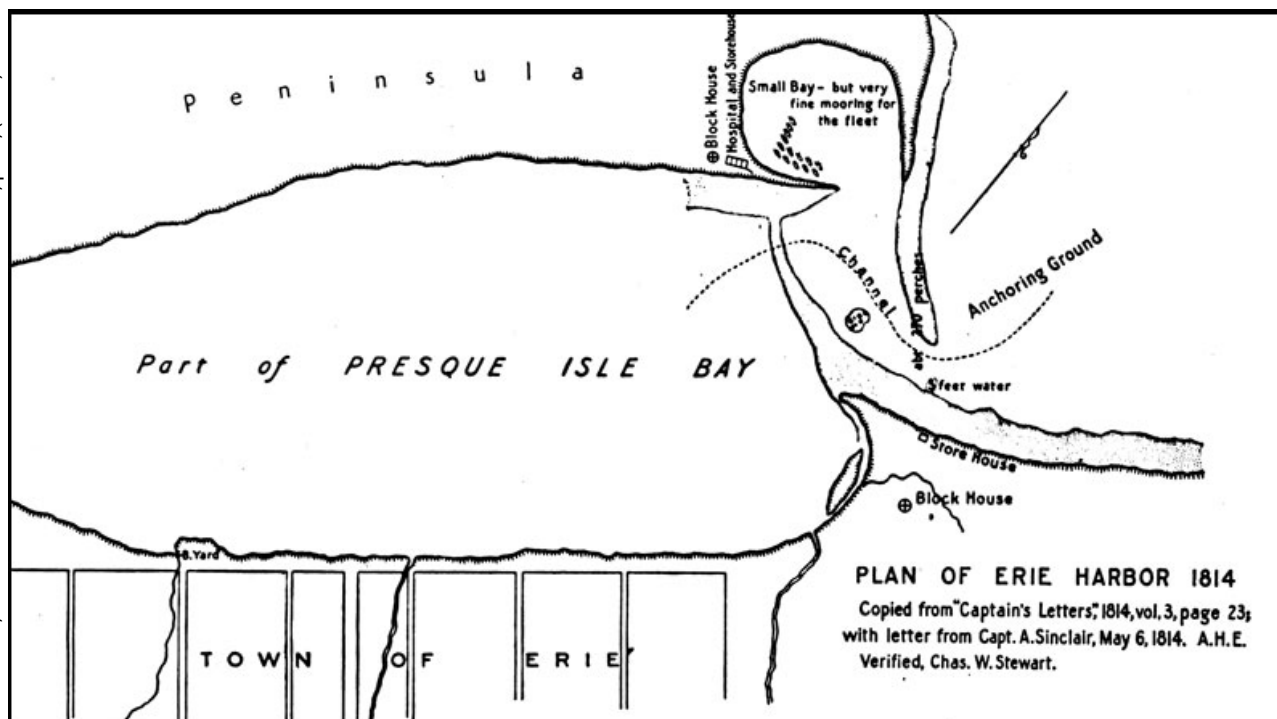


Figure 5. Erie, Pa. Harbor before improvement.

from one state and used it to benefit another. Another faction took the opposite view. Led by Henry Clay of Kentucky, they argued that a series of transportation projects across the country helped draw the nation together and improved the general prosperity. This latter position won out in 1824 when Congress passed the General Survey Act. This legislation authorized the President to order studies to be made of roads and canals "of national importance, in commercial or military point of view, or necessary for the transportation of the public mail." The wording was important as the reference to military necessity, and the public mail tied the measure to powers granted to the federal government under the Constitution's defense and commerce clauses. While nothing was said about harbor improvements in the bill, President James Monroe went ahead and used the bill to authorize United States Army engineers to conduct surveys of harbor improvements that were needed on the Great Lakes. Erie, Pennsylvania, was one of the first sites selected and on the engineer's recommendation Congress allocated funds to build structures to open a deep passage into Presque Isle Bay.⁶⁷

When John Quincy Adams was sworn in as the new president in March of 1825, he intended to use the General Survey Act as a springboard for a broad program of wise investments in the nation's transportation infrastructure. In his annual address to Congress, he called for a broad systematic plan. What he got instead was an omnibus bill allotting \$86,000 to twenty road, canal, river, and harbor projects. It was not all that Adams wanted, but it temporarily broke the Congressional logjam and funding flowed to Great Lakes harbors including Buffalo, Cleveland, and St. Joseph on far Lake Michigan. The need was acute on all the lakes, but it was particularly frustrating on Lake Erie since

42 67 Todd Shallot, *Structures in the Stream: Water, Science, and the U.S. Army Corps of Engineers* (Austin: University of Texas Press, 1994), 127.

that body of water had the most lake traffic. A traveler on the steamboat *Niagara* from Buffalo to Detroit in 1828 was dismayed to find that the only way for passengers to get ashore on Lake Erie was for them to disembark from the steamer on to small boats or scows that could get over sandbars that obstructed harbor mouths. Passengers were “thus landed from the *Niagara* at Dunkirk, Erie, and Ashtabula;” but when the steamer reached the mouth of the Cuyahoga River where there was no Cleveland harbor it was impossible to make a landing. Strong winds had kicked up water too rough to attempt a disembarkation via small boats. When the steamer reached its next stops at Huron and Black River the same thing happened. Passengers for those destinations “were obliged to remain on board, trusting to have better luck on the downward voyage.” At Cleveland, the swampy entrance to the Cuyahoga River was both difficult to locate, and it was beset by a sand bar that prevented entrance to a vessel even drawing as little as thirty inches in the water. As early as 1816 settlers there tried and failed to construct works that would keep sand away from the river mouth. In 1825 the United States Congress authorized a \$5,000 dollar appropriation to build a pier six-hundred feet out into Lake Erie. The pier was supposed to block the flow of sand along the shore and keep a deepened channel open. The project failed and a second pier parallel to the first was built. The problem persisted until 1828 when the piers combined with channel work opened the river mouth.⁶⁸

Lake Ontario had a fine natural port at its eastern end in Sacket’s Harbor. Along the southern shore of the lake in New York State, there were few other locations so blessed. Army engineers were called in to help lakeside towns reach their maritime potential. Where lighthouses had earlier been built, piers and dredges were added. In 1828 a compressive survey of the lakeshore was made with a view to determine the most promising harbor sites. Oswego, Genesee, and Sodus all received early attention. Lake Ontario, however, had lost its lead in Inland Seas’ commerce following the opening of the Erie Canal. Cut-off from the other lakes by Niagara Falls, it was not an important part of the movement of people from east to west although for several decades it was able to compete in the west to east movement of agricultural products. This later traffic was enabled by the 1828 completion of a canal that linked Oswego with the Erie Canal and federal improvements to the town’s harbor. Lake Ontario ports such as Sacket’s Harbor and Oswego were able to lobby successfully for more than their share of internal improvement funds because they could play the national security card and remind Washington how important the lake marine was in the War of 1812.⁶⁹

At issue with requests for federal harbor improvements was more than economic development or national security. The safety of crews and cargoes was the reason for navigational aids. Lighthouses were useful in helping mariners accurately assess their position on the lake and for warning them of some of the hazards lurking beneath the waves. Just as important, if not more so, as a safety issue the

68 H. Massey, “Traveling on the Great Lakes When Detroit Was Young,” *Michigan Pioneer and Historical Collections*, Vol. 6, (Lansing: Thorp and Godfrey, 1886), 131-33; Jay C. Ehle, *Cleveland’s Harbor: The Cleveland-Cuyahoga Port Authority* (Kent, Ohio: Kent State University Press, 1996), 6; “Origins of the Detroit District,” *Great Lakes Update* (US Army Corps of Engineers Detroit District), Vol. 172 (July 2008), 2.

69 Nuala Drescher, *Engineers For the Public Good: A History of the Buffalo District of the Army Corps of Engineers* (Buffalo: United States Army Corps of Engineers, 1982), 100-9.

lighthouse showed the way to a place of refuge. This was particularly a problem on Lake Michigan. The northern third of the lake is filled with islands and peninsulas. These land formations presented many navigational challenges, but in a storm it was theoretically possible to find a sheltered anchorage in which to ride out the weather. The southern portion and larger area of the lake, however, is devoid of islands and the shoreline offers a largely uniform and low relief appearance. The normal wind pattern is from the north or west. When a gale strikes, it has two-hundred miles of open water in which to build ship-shattering waves. "The total absence of harbors round this southern extremity of the lake has caused the wreck of many a vessel," observed Charles Latrobe in 1833. He was an English traveler who noted with unease the remains of wrecked ships along the dune-covered shore of the lake. The cause he recognized was "the action of the storm from the northward upon such an expanse of fresh water is tremendous; and from the base of the sand hills, and the utter solitude of this coast, lives are seldom if ever saved."⁷⁰

St. Joseph, Michigan, one of the oldest settlements along Lake Michigan, first received Congress's attention. An 1826 appropriation helped to increase the depth of the St. Joseph River mouth, but the meager funding ensured that a clear passage from the lake into the river was only temporary. By 1828 General Charles Gratiot of the Army Engineers reported to Congress that there were forty-four river and harbor improvement projects underway on the Great Lakes. None of these projects, however, included Chicago where makeshift efforts to create a harbor had floundered. For the hundreds of pioneers brought by ship to the town each day, it meant the necessity of keeping an eye on the western horizon for any sign of dark clouds. A sudden lake storm might destroy their vessel as they awaited the small row boats and skiffs that would bring passengers and cargo across the sand bar and into the shelter of the Chicago River. It was not until the spring of 1833 that Congress finally approved a \$25,000 appropriation to clear the sand bar and create a true harbor. That summer the schooner *Austerlitz* arrived with supplies and workmen and construction began on works that would make it possible for ships to enter the Chicago River.⁷¹

The saga of trying to make a port out of the Chicago River reveals the tremendous challenge faced by the government as it tried to improve navigation on the Great Lakes. In 1823 Army Major William H. Keating warned the government that "the extent of the sand banks, which are formed on the eastern and southern shore, by the prevailing north and northwesterly winds, will...prevent any important work being undertaken to improve the port of Chicago." Nonetheless, Congress had authorized a generous land grant to the State of Illinois to stimulate the construction of a canal that would unite Lake Michigan at Chicago with the Mississippi River system. A harbor at the terminus of lake navigation was essential and so the army went to war with nature. Unfortunately, it could only command a very feeble force. Laborers were scarce on the frontier, and those who were available

⁷⁰ Charles J. Latrobe, *The Rambler in North America*, Vol. 2, (London: R.B. Seeley and W. Burnside, 1835), 190, 202.

⁷¹ John Larson, *Those Army Engineers: A History of the Chicago District of the U.S. Army Corps of Engineers* (Chicago: United States Army Corps of Engineers, 1979), 24-25.

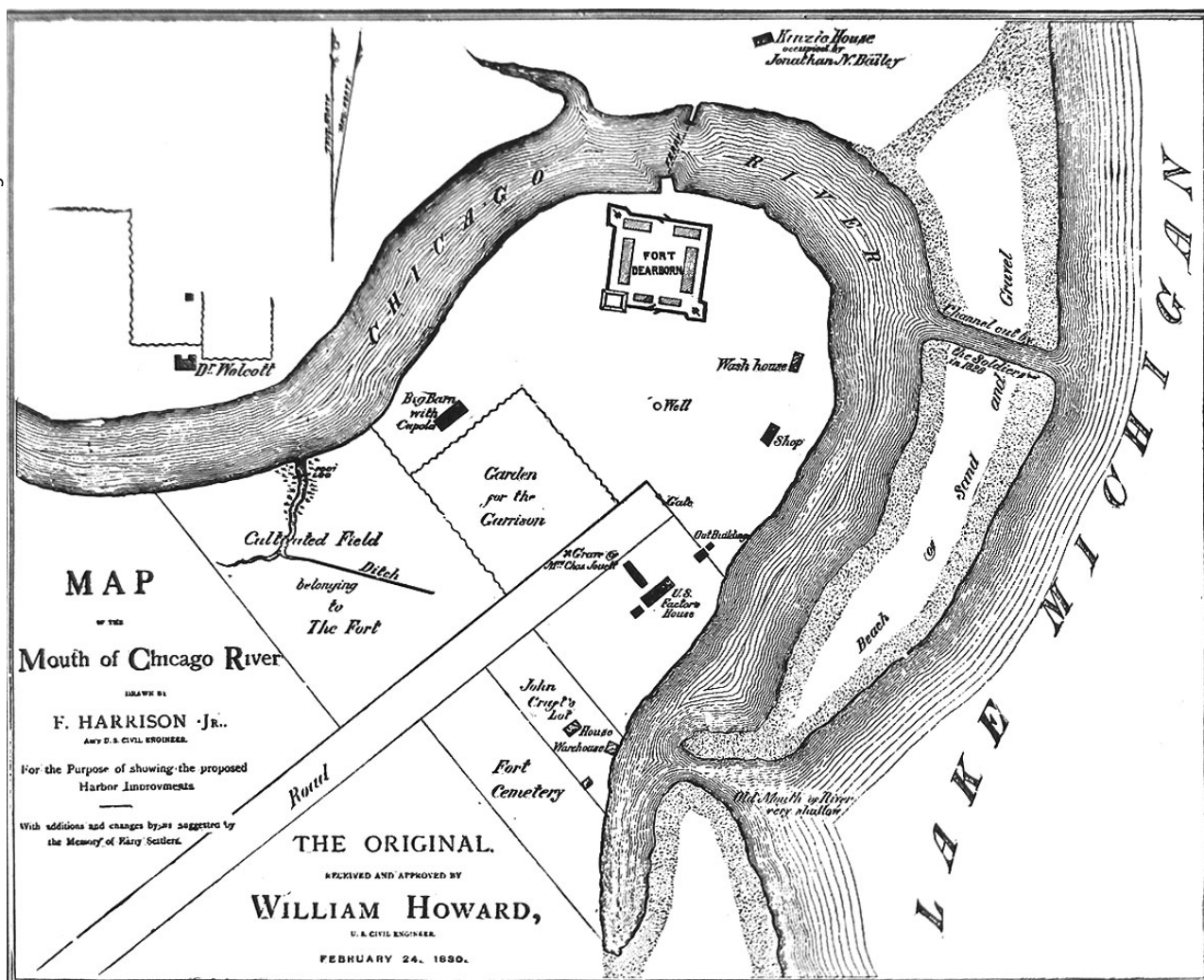


Figure 6. Early attempts to force a harbor entrance through the sand bar at Chicago.

demanded double the wages paid in the East. Men skilled in the use of the forges and pile drivers needed to construct piers were unavailable altogether. Once men were retained they had to be housed, and even provided with bedding in this frontier location. Lumber needed for the piers was available but only at exuberant prices that forced the Army to detail teams of men into the hinterland to harvest and transport oak logs. Money was in short supply because the government deposited funds in banks that were hundreds of miles away from the work site. Work began in 1833 with a \$25,000 appropriation. The following year, with the work barely begun and the initial funds exhausted an additional \$38,801 was allotted. This amount was supplemented with another \$32,000 in 1835. The work continued at a snail's pace and the project managers requested and received \$40,000 in March 1837. The two piers jutting out from the mouth of the Chicago River and the dredged channel to Lake Michigan were finally completed in 1838 after a final infusion of \$30,000. By that time hundreds of vessels were making regular use of the new harbor. Captain James Allen, who supervised the project, warned Washington that sand was accumulating against the north pier at an alarming rate: "This

being the only shelter for a distance of more than 300 miles...the greatest solicitation is felt for its continued improvements and permanent security by all interested in extensive navigation on this lake.” The federal government had just invested more than \$165,000 to create the first harbor on Lake Michigan, and it was warned that more costly work would be required to keep it open. In the wake of the Chicago experience, the federal government moved slowly to improve other harbors on lakes Michigan and Huron.⁷²

Projects on Lake Erie also drove home the point that harbor improvements absorbed cash like a sponge. In 1829 an Army engineer’s survey floated the possibility of creating a much needed harbor as a refuge at the western end of the lake. In 1830 a wooden breakwater was constructed to create a sheltered anchorage in La Plaisance Bay. Within a year autumnal storms wrecked the structure. A larger, stronger breakwater replaced it in 1835. Within two years it was so battered by ice and waves that it was, in the words of an Army engineer, in “a progressive state of dilapidation.”⁷³

The Canal Craze

The example of the wildly successful Erie Canal and the boosterism of President John Quincy Adams inspired Americans to envision a broad network of interlocking waterways. Virginians called for a canal from the Potomac to the Ohio River while Philadelphians planned a waterway from their city to Pittsburgh. The fact that the Appalachian Mountains stood in the way of both projects neither dampened enthusiasm or fund raising and construction began on each. The economic calculations behind these schemes were blinded by the dazzling chimera of the Erie Canal’s finances. The \$7 million cost of the canal was paid off with toll fees by 1832, and canal revenues went on for many years to fund almost the entire budget of the State of New York. Canals appeared to be surefire economic development engines and potential money-making machines. Between 1816 and 1850 the number of canal miles in the United States increased from about 100 miles to close to 3800 miles. Britain’s Canadian colonies, dismayed by how New York’s artificial river had diverted the commerce of the Great Lakes from their natural channel on the St. Lawrence River, hastily built a series of canals around the Lachine Rapids near Montreal and undertook the even more daunting task of building a canal around Niagara Falls. The Welland Canal connecting Lake Ontario with Lake Erie opened in 1829.⁷⁴

Great Lakes states were particularly swept up in the current of canal mania. Ohio led the way with two major canals. As early as 1816 Ohio’s governor Thomas Worthington proposed a waterway linking Lake Erie and the Ohio River. However, it was not until the Erie Canal was a reality that Ohio legislators approved construction. The first canal was to follow the Scioto and Muskingum River valleys

⁷² Larson, *Those Army Engineers*, 24-37.

⁷³ “Origins of the Detroit District,” *Great Lakes Update* (US Army Corps of Engineers Detroit District), Vol. 172 (July 2008), 2.

⁷⁴ Mortimer G. Barnes, *Inland Waterways: Their Necessity, Importance and Value in Handling the Commerce of the United States and Reducing Transportation Costs*, (Springfield: State of Illinois, Division of Waterways, 1920), .8 ; Alex Rolland, *The Way of the Ship: America’s Maritime History Reenvisioned, 1600-2000* (Hoboken, New Jersey: John Wiley & Son, 2008), 145.

to link Cleveland with the Ohio River. The second waterway was to connect Toledo with Cincinnati. By 1825 more than two-thousand workmen labored on these ambitious schemes. When cost escalated and threatened to stop construction, the federal government stepped in with a generous land grant that provided the revenue to complete the waterways. The canals proved particularly important to Cleveland and Toledo, who gained sizeable hinterlands in the interior of the state because of their access to water transportation with the East Coast via the Erie Canal. The system was very much a work in progress for many years with feeder canals added over time until the state could boast more than one-thousand miles of artificial waterways.⁷⁵

Indiana would not be outdone. It had barely achieved statehood before it dreamed up what would become the longest canal of the era—the 468-mile Wabash and Erie Canal. The upper portion of the waterway required the cooperation of the State of Ohio for Indiana intended to use Toledo as its Lake Erie terminus. Out of fear of competition from its neighbor's project Ohio dragged its feet on approving the easiest portion of the right-of-way until 1843. The hard part of the project began in northeastern Indiana where a channel had to be grubbed out and excavated through the hardwood forest to the headwaters of the Wabash River. As many as five-thousand men labored on the canal at one time. Yet progress was slow as the work stopped and started. The financing of the endeavor was eccentric, if not fraudulent. Segments of the waterway were opened gradually, but completion was elusive in spite of three generous federal land grants. The waterway was not fully functional between the Ohio River and Lake Erie until 1853. The canal never yielded anywhere near enough in tolls to pay for its cost, but it did provide important commercial stimulus to much of the interior of Indiana.⁷⁶

Illinois' venture into canal speculations had nearly as checkered a history as that of the Hoosier State. In 1818 when Illinois applied for admission to the Union, it successfully had its boundary adjusted thirty-one miles to the north so as to ensure that a canal connecting Lake Michigan with the Mississippi Valley would be within its boundaries. An Illinois and Michigan Canal was a dream older than the state itself. Boosting the state's efforts to build the canal was Abraham Lincoln, then just a young state legislator. He helped craft the bill that got construction started in 1836. When the national economy crashed in 1837 and the state teetered on the edge of bankruptcy, Lincoln struggled to keep the project alive. Construction stopped, restarted, and its planned deep cut was dropped in favor of a more modest excavation. Finally, in 1848 the project was completed, but by that time a railroad paralleled its right-of-way. Nonetheless, the waterway was an important conduit for the great harvests of grain and lumber that made Chicago the metropolis of the West.⁷⁷

The building of these extensions of navigation had a major impact on the economy of the Great Lakes region. While many canal projects such as the Erie and Wabash failed to meet the unrealistic expectations of their boosters, all of the canal projects contributed to the growth of the region. The

75 R. Douglas Hurd, *The Ohio Frontier: Crucible of the Old Northwest* (Bloomington: Indiana University Press, 1996), 389-95.

76 Ronald E. Shaw, *Canals for a Nation: The Canal Era in the United States, 1790-1860* (Lexington: University of Kentucky Press, 1990), 137-42.

77 James William Putnam, *The Illinois and Michigan Canal: A Study in Economic History* (Chicago: University of Chicago Press, 1918), 102-7.

mere promise of a canal attracted settlement and local investment that otherwise would have gone elsewhere. Construction brought a flurry of economic activity and a wave of workers to the canal areas. Federal land grants further stimulated the movement of people to the region. Finally, the completed waterways reduced shipping costs for commercial activity and increased the value of property that lay within a days' travel of the right-of-way. The canals were a powerful example of the spirit of progress that flowed west from the Erie Canal. Along with the lighthouses and harbors that were constructed along the Great Lakes, the canals were the embodiment of a commitment by the people of the region to join in commercial union with the developed states of the East Coast. They had moved to a frontier region, but they had no intention to remain peripheral in economic, political, or cultural life. The region of the country known as the remote "northwest" was making the first steps toward becoming the nation's "heartland."

CHAPTER 3

The Era of Bad Feelings

1839–1860

May of 1840 came in like a lion whipping up the waters of frigid Lake Michigan and devoured vessels caught on its broad unbroken expanse. On May 1st a northeast gale drove the stout steamer *Champlain* to her doom. Neither anchor line nor engines pumping for all they were worth could prevent her from being driven ashore and smashed to pieces by the heavy surf. The daring intervention of the schooner *Minerva Smith* saved all aboard the doomed steamer, although the cargo worth \$10,000 was a total loss. Elsewhere out on the lake the spring storms took a heavy toll. The steamer *Governor Mason*, on her maiden voyage was driven onto a sand bar at the mouth of the Muskegon River and she caught fire. Between the flames and the pounding waves she was a total loss with an unknown number of lives lost. The schooners *Memee*, *Drift*, and *Victory* all suffered severe damage but managed to stay afloat. A Milwaukee businessman disgusted at the losses wrote to Congress, “There has been enough property lost within the last ten days on Lake Michigan, to have built three good harbors.” He bitterly added “what a pity” the lost ships were not “loaded with Senators and members of Congress.”⁷⁸

By 1840 people living along all of the Great Lakes were disgusted with the federal government. No funds had been allocated for harbor improvements since 1838. Merchants in burgeoning lake towns like Milwaukee, Racine, and Kenosha in Wisconsin and Muskegon and St. Joseph in Michigan were being economically stymied by the lack of safe harbors. In 1840 there were forty-eight steamboats on the Upper Great Lakes representing an investment of \$2.2 million. Mariners who made their living on those steamboats and the 250 sail vessels were particularly and colorfully vocal. One sailor later recalled a master “who had achieved notoriety in these waters in the early days for his profanity... expressing his fervent hope, when he had a United States Senator aboard as a passenger, that he might run into a gale to convince the legislator of the hazards of inland navigation.” There was only one fully developed harbor on the lower part of Lake Michigan. Even that harbor at Chicago was regarded by sailors as “in wretched condition” with little in the way of “lights and Buoys to guide the mariner.”⁷⁹

The “wretched condition” all across the broad northern lakes was the result of sectional politics and antifederalist ideology. The United States government, born in 1789, began life riven by competing

⁷⁸ *Buffalo Commercial Advertiser*, 13 May 1840; *Cleveland Daily Herald*, 13 May 1840; Mansfield, *History of the Great Lakes*, Vol. 1, p.634; Larson, *Those Army Engineers*, 54.

⁷⁹ James L. Barton, *Letter to Hon. Robert McClelland Chairman of the Committee on Commerce in Relation to the Value and Importance of the Commerce of the Western Great Lakes* (Buffalo: Jewett, Thomas, and Company, 1846), 8-12; Isaac Stephenson, *Recollections of a Long Life, 1829-1915* (Chicago: Privately Printed, 1915), 92-93.

political philosophies. Federalists advocated a strong national government exercising all powers not specifically delegated to the states of the Union. The anti-federalists opposed the idea of a national government that dominated the states and demanded an interpretation of the Constitution that limited the federal administration to only those powers specifically enumerated. These differences led to the nation's first party system, the Federalists versus the Republicans. This lasted until James Madison left the presidency. Madison and Thomas Jefferson had been leaders of the Republican Party. But Madison's retirement and a weakening of the Federalist Party organization created an opportunity for a period of political rapprochement. From 1817-1825 President James Monroe presided over what people at the time called the "Era of Good Feelings" as members of the competing parties came together in a spirit of cooperation. Party divisions all but disappeared and a new spirit of nationalism animated the federal government. The initial expansion of Great Lakes lighthouses, navigational aids, and harbor improvements took place in this cooperative atmosphere. The administration of John Quincy Adams continued and boldly expanded the commitment to national prosperity stimulated by federal investments in internal improvements. Unfortunately for Adams, however, "good feelings" among the nation's leaders—at this point all members of the Republican Party—evaporated due to the heated opposition of Andrew Jackson and his supporters. Jackson felt he had been cheated of the presidency in the disputed election of 1824, and he did everything he could to undermine Adams. He rallied support to his cause by espousing the antifederalist rhetoric of Jefferson and Madison and opposing Adams's internal improvement programs.⁸⁰

As president, however, Andrew Jackson loved executive power too much to fully follow the antifederalist rhetoric he espoused in opposition. He used his executive authority to build his base of support through patronage and the careful support of internal improvements. In 1830 he made a great show of vetoing an alleged extension of the National Road known as the Maysville Road claiming such improvements were the province of state and local governments. Yet at the same time, he repeatedly signed legislation that authorized harbor improvements on the Great Lakes and river-clearing projects on the Mississippi. By doing so he greatly aided the development in those regions and built allegiance to his newly formed Democratic Party. Jackson focused his anti-federalism on the Bank of the United States, which he set about systematically destroying. Unfortunately, that action and his ill-advised handling of federal financial resources caused a major national banking crisis and widespread depression. Known as the Panic of 1837, it hit just after Jackson left office. Martin Van Buren inherited the mess Jackson had created, although as vice president during "Old Hickory's" second term, he had helped to create the conditions for the five-year depression. The public certainly blamed Van Buren for the nation's woes, which made him desperate to bolster his position. To do so the native New Yorker courted the support of Southerners. He did this through tariff policy and by

⁸⁰ For more on the origins and demise of the "Era of Good Feelings" see, Daniel Walker Howe, *What God Hath Wrought: The Transformation of America, 1815-1848* (New York: Oxford University Press, 2009) for a competing perspective particularly on the rival political forces of the era see, Sean Wilentz, *The Rise of American Democracy, from Jefferson to Lincoln*, (New York: W.W. Norton, 2005).

slashing spending on internal improvements. Van Buren had always treated internal improvements inconsistently, motivated by political expediency. But during his presidency, it became an article of faith of the Democratic Party that federal support of harbor or canal projects was unconstitutional. From 1840 until the Civil War every national Democratic Party platform included the following language: “Resolved, That the constitution does not confer upon the general government the power to commence and carry on, a general system of internal improvements.”⁸¹ Southern support for this was solid because a government that could aggressively develop the country’s economy might gain the power to attack slavery in the states.

Martin Van Buren was booted from the White House in the 1840 election that featured the famous slogan “Tippecanoe and Tyler Too.” The Whig Party, which had formed in reaction to the anti-federalism of Jackson and Van Buren, nominated the victor in the 1811 Battle of Tippecanoe, William Henry Harrison. Unfortunately for the Whigs, Harrison caught a serious cold at his inauguration, and with a little help from his doctors, he was dead less than a month after taking office. Worse still his Vice President, John Tyler of Virginia, was a former Democrat who held strong states’ rights views and soon turned his back on the Whigs. Therefore, presidential opposition to improved navigation continued.

Fighting the Political Current

During the 1840s congressmen from Great Lakes states were inundated with testimonials from constituents desperate to secure aids to navigation. At the close of the 1842 shipping season, Eber Brock Ward, who as a boy helped his father man the Bois Blanc Lighthouse on Lake Huron, wrote to Michigan Senator William Woodbridge “on behalf of our suffering commerce.” Ward first went before the mast as a cabin boy, and he matured into a successful mariner. He was master of the steamer *Huron*, a vessel owned by his uncle, Sam Ward, which he sailed between Buffalo and Chicago carrying large numbers of immigrants bound for the prairies of the West. Writing on behalf of the “over 4,000 men employed in navigation” he complained about the “frequent distressing shipwrecks on Lake Michigan” and the “want of a few good harbors on that lake.” Ward regarded as “indispensably necessary” improvement at three harbors in particular, Chicago, Milwaukee, and St. Joseph. In addition to dredging, these harbors required beacon lights on their piers. “The arrivals and departures of steamboats at Chicago the past year are upward of 480, and St. Joseph 260, besides a great number of ships, brigs, and schooners, arriving and departing daily freighted with the agricultural products of the most fertile portion of the United States.”⁸²

In referring to the agricultural products of the West, Ward was attempting to demonstrate that the request for navigation improvements on the Great Lakes was not a local issue but one of national

81 John L. Larson, *Internal Improvement: National Public Works and the Promise of Popular Government in the Early National United States* (Chapel Hill: University of North Carolina Press, 2001), 183; “Democratic Party Platform, 1840,” 6 May 1840, American Presidency Project, <http://www.presidency.ucsb.edu/ws/index.php?pid=29572>, accessed November 2014.

82 E.B. Ward to William Woodbridge, Senator from Michigan, 26 December 1842, printed in Larson, *Those Army Engineers*, .55.



Figure 7. Eber Brock Ward. Ship Captain, ship builder, industrialist.

significance. In the past, national leaders such as George Washington and later John Adams and Henry Clay had argued that citizens deserved a government that was responsive to their needs. What they got instead under Jackson and the Democratic Party was a government that was beholden to wealthy planters and which rejected the pursuit of the public good in favor of unleashing the pursuit of private gain. But what ideologues in the East did not understand was that in the Great Lakes Region, private interests required public expenditure to thrive. Eber Brock Ward, for example, was as much of a capitalist as any man. In later years, he would own the largest fleet

of ships on the lakes, become a prominent real estate investor, and one of the founders of the modern steel industry in the United States. Yet in 1842, he was only a young man on the make. He could build and master a ship. He could attract large numbers of immigrant passengers to embark with him. What he could not do, however—what no individual businessman could do—was construct a harbor, build a lighthouse, or chart shoals and reefs. Such improvements would increase the profitability of his shipping investments and make travel safer for his passengers. Absent those improvements, he did the Jacksonian thing and pursued his private self-interest. He operated less profitably and less safely all the while looking to change the political dynamic that turned a blind eye to the broader public good.⁸³

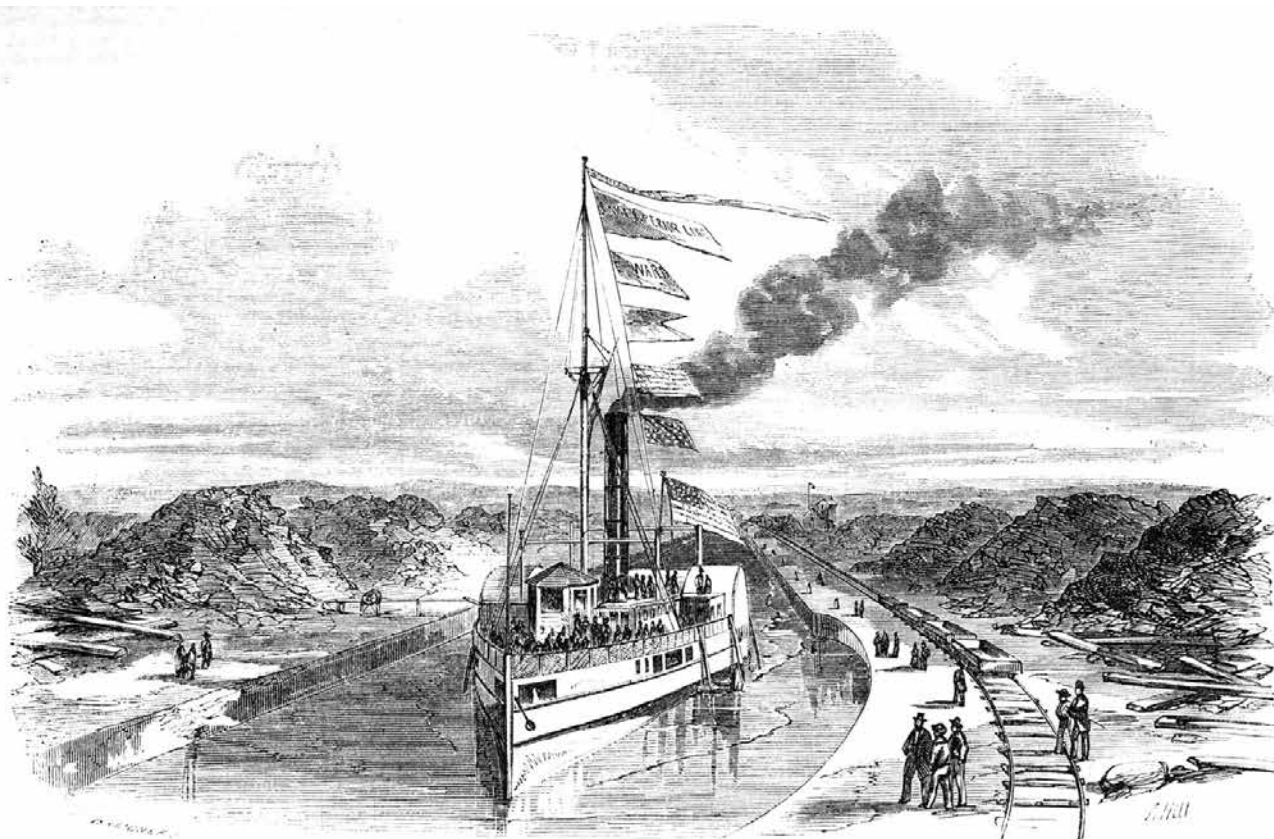
In the wake of the ascendancy of the anti-improvement Democrats, Great Lakes area people and politicians tried to make do as best they could. In 1839 Captain Thomas Jefferson Cram had been appointed as the United States Army engineer's "head of harbor improvements on Lake Michigan." He and his assistants surveyed harbors for Milwaukee, Kenosha, Manitowoc, Sheboygan, and Kewanee in the Wisconsin Territory and Calumet in Illinois. President Van Buren, however, ensured that funding was reduced to a rare trickle, a policy followed by John Tyler as well. In April 1840 two schooners attempting to load cargoes at Milwaukee were driven ashore by a gale. "They now lay high upon the

52 ⁸³ Finding Aid, Eber Brock Ward Papers, Clarke Historical Library, Central Michigan University; Larson, *Internal Improvement*, 223.

beach” editorialized the *Milwaukee Sentinel*, “a striking and forceful illustration of the necessity of an appropriation for the improvement of our harbor.” Just a year earlier four people drowned trying to row out to an anchored vessel because there was no harbor. An attempt to fund improvements by private subscriptions among Milwaukee citizens fell short of what was needed. In 1842 the town’s newspaper, in an effort to shame the government, offered to loan the federal government the money to begin harbor improvements. Finally, in 1843 Wisconsin’s territorial representative in Congress, backed by editorials and petitions from Chicago to Buffalo, managed to wrangle a modest \$30,000 appropriation. The town’s joy, however, was short lived. Captain Cram insisted the best he could do with the money was improve the natural mouth of the Milwaukee River. The work allowed a ship to enter the river, but it then had a mile of narrow, sinuous river to navigate before it could reach the town. Such a passage was difficult for steamboats but impossible for schooners, which made up the bulk of the lake marine. In disgust Milwaukee businessmen built a pier from the sand bar downtown a quarter of a mile out into the lake. It allowed ships to dock near the town, but only in fair weather conditions. Kenosha and Racine also received a modest appropriation when Milwaukee did, but little could be accomplished in a single season of work.⁸⁴

Communities along the Upper Great Lakes resigned themselves to having to bootstrap a path to safe navigation. Milwaukee, Racine, and Chicago all undertook independently funded and executed projects. Between 1843 and 1851 Racine, although it was only a town of six-thousand residents, used taxes and private donations to invest \$43,000 to improve its harbor. Milwaukee wrangled a modest \$15,000 appropriation in 1851. The project was budgeted at \$90,000 so the town raised an additional \$50,000 on its own to get the job started. Chicago was outraged in 1854 when four ships sank after trying and failing to enter its “improved” harbor. The Army engineers were without funds or authority to address the problem. The Chicago Board of Trade understood that unless the harbor was opened, their grain exchange would soon be shuttered. They appealed to Secretary of War Jefferson Davis to allow the city to borrow the Army engineer’s steam dredge to clear the river mouth of sand. Davis refused. In an act of rebellion that rankled the future Confederate leader the Chicagoans seized the machine anyway and opened their harbor. Far to the east on Lake Ontario the same problems prevailed. Oswego’s harbor, which had only been partially improved in the 1830s, remained marginally functional only because private enterprise stepped up to fund necessary work. Vermillion, Ohio, long sought a lighthouse to mark its harbor entrance. Before one was finally authorized in 1847, the town’s mariners drove posts into the water from which they hung oil lamps. Smaller towns on the Lake Michigan frontier despaired over ever getting federal aid. At Manitowoc, Two Rivers, and Sheboygan in Wisconsin private piers were built out into the lake. These were commercial endeavors and both farmers and vessel masters had to pay a hefty premium to make use of their facilities. They were useful only in good weather, and any skipper tied up there kept a wary eye on the horizon if he wanted to

⁸⁴ John Gurda, *The Making of Milwaukee* (Milwaukee: Milwaukee County Historical Society, 1999), 45-48; Karamanski, *Schooner Passage*, 54-55.



LOWER ENTRANCE SAULT STE. MARIE CANAL.

Figure 8. Sault Ste. Marie Canal.

keep his ship from ruin.⁸⁵

The collapse of federal support for internal improvements hit the development of Lake Superior commerce particularly hard. The St. Mary's Falls blocked the passage of vessels from Lake Huron to the northernmost lake. A handful of small sailing ships had been moved around the falls by means of log rollers, but this was hardly the means to unlock the region's mineral wealth. Almost as soon as Michigan became a state, it had attempted to set in motion the building of a canal that would open Lake Superior to navigation by lake vessels. In March 1837 the new state legislature funded an engineering study. With that in hand they went to Congress the following year, but failed to win legislative support. Undaunted the state committed \$25,000 to begin the canal. It also tried a new approach to Congress, this time asking not for money but for a land grant of 100,000 acres. The Congress had earlier made such grants to the Illinois and Michigan Canal and to the Erie and Wabash Canal so Michigan had reason to be optimistic. It was, however, summarily rejected. Even the Senate's great supporter of internal improvements, Henry Clay, rejected the proposal referring to the Lake Superior canal as "a work beyond the remotest settlements of the United States, if not in the moon." It was not until the 1850s that Congress could be persuaded to act. Ship owner Eber Brock Ward and other businessmen spent the winter of 1850-51 in Washington, D.C., lobbying for federal support.

54 ⁸⁵ Karamanski, *Schooner Passage*, 58-59; Larson, *Those Army Engineers*, 80-94.

The Michigan delegation floated a bill for a \$500,000 federal appropriation only to see it scuttled by Southern opposition. But specimens of copper and iron ore from the Upper Peninsula of Michigan persuaded Congress to make a 750,000-acre land grant to support construction.⁸⁶

While the federal land grant stimulated the Sault Ste. Marie canal project, it was carried to completion in keeping with the Jacksonian commitment to private enterprise. The State of Michigan hired a company made up of some of the largest New York financiers and Democratic Party insiders to manage the excavation. In return, they would receive the entirety of the vast 750,000 acre land grant. The effect was to turn over huge portions of the public domain to a private corporation. The investors were able to choose whatever acres they wanted from public lands anywhere in the state. They chose very wisely and secured most of the best pine lumber and mineral lands in the state eventually reaping millions of dollars as their reward. Fortunately within two years, the canal was completed. The first ship passed through the locks in June of 1855 and Lake Superior became an integral part of the Great Lakes commercial system.⁸⁷

Evolution of Great Lakes Ships

The unimproved and frontier conditions that prevailed on the Great Lakes shaped the way ship technology developed along the inland seas. This was particularly true of sailing ships. Early vessels on the Great Lakes were merely copies of designs perfected on saltwater. Shipbuilders on the inland seas adopted sloops and schooners, both fore-and-aft rigged ships the former with a single mast, schooners with two or more masts. Both of these types of vessels were popular for coastal trading along the Atlantic seaboard. Also put into use were brigs (a two master rigged with square sails) and brigantines (a two-master with the fore sail square rigged and the aft sail fore-and-aft). The *Niagara* that Oliver Hazzard Perry sailed to victory on Lake Erie was a brig. The hundred foot-long *Ramsay Clark* built by the American Fur Company in 1836 was also an example of a brigantine. Overtime, vessels rigged with the fore-and-aft sail proved the most popular. The reason for this was twofold. First, fore-and-aft sails were set from a stout wooden gaff that projected from the mast parallel to the hull. Such a sail could be set from the deck by hauling on lines. This meant that fewer people could set this sail in a shorter amount of time than it would take to deploy a square sail, which hung from a spar high on the mast and could only be set by sending several men aloft to work in concert. Setting a sail or taking it in quickly was an advantage on the enclosed waters of the Great Lakes. Second, sails set from the deck required fewer crew members, an obvious advantage from a business point of view.⁸⁸

As schooners were coming to dominate the lake, marine shipbuilders along the lakes began to tinker with their design to best meet the needs of these dangerous frontier waters. One of the most important of these adaptations was the use of a retractable keel or drop centerboard. Keels help a vessel

⁸⁶ William Chandler, *Illustrated History of the St. Mary's Falls Ship Canal* (n.p.: Chapman & Kibby, 1893), 2-8.

⁸⁷ Willis F. Dunbar and George S. May, *Michigan: A History of the Wolverine State* (Grand Rapids, Mich.: William Eerdmans, 1995), 260-61.

⁸⁸ Mark L. Thompson, *Graveyard of the Great Lakes* (Detroit: Wayne State University Press, 2000), 28-29; Karamanski, *Schooner Passage*, 26-29.



Figure 9. The schooner Hattie Hutt, built in Saugatuck, Mich., 1873, wrecked 1929.

stay on course. A center board was a portion of the keel that extended several feet into the water giving a vessel much greater stability. With a center board, a small sailing vessel could confidently set more canvas and lean with the wind yet not risk capsizing because the extension under the keel balanced the weight of tall masts. A vessel with a centerboard was likely to sail much faster than one with just a regular keel. Large cargo vessels enhanced their stability with ballast or by carefully loading a heavy cargo.

Centerboards improved their handling by stiffening their resistance to the wind. Vessels tacking their way up the lake would inevitably drift sideways. Centerboards substantially reduced the amount of drift allowing a master to keep true to his intended course. Unfortunately, what made the center board so effective in the open sea became a liability when in shallow waters of shoals, rivers, and especially unimproved harbors. Center boards drastically increased the draft or the depth drawn by a loaded vessel. On the eve of the American Revolution, John Schank, a Royal Navy captain, began to experiment with a retractable centerboard that could be deployed in deep water when at sea and then pulled up as a vessel entered a harbor. Some of his early prototypes were tested on the Great Lakes, and by the War of 1812 the device had been perfected.⁸⁹

In the early 1850s, a shipbuilder in Manitowoc, Wisconsin, used the retractable centerboard as a key element in his clipper schooners. William Wallace Bates was among the most influential shipbuilders in nineteenth-century America. Born in Nova Scotia and raised in Maine, he learned the art of shipbuilding from a master of the craft, his father. He moved to the Great Lakes in 1845 and four years later started a shipyard in Manitowoc. The town was well-positioned to tap fine stands of oak to make stout hulls and towering pines for durable masts capable of carrying a large spread of canvas. His clipper schooner was inspired by the famed Baltimore clippers that sailed rings around British frigates in the War of 1812. Bates modified these ships by giving it a shallower draft and an almost flat bottom. He kept the clipper's sharp, sleek ends and, with the drop center board, had a vessel that could swim in only a few feet of water but also sail close to a stiff breeze. His first design, *Challenge*, slid off the stocks in 1852. A year later *Clipper City* joined her. Both proved fast, reliable, and their

ample holds with wide hatches made them well adapted for carrying bulk cargoes. Thus was born the classic Great Lakes schooner that would crisscross the lakes for a half century. It was finely tuned to its environment and economic niche. The flat bottom was well-suited to carry large cargoes into shallow harbors while the centerboard paired with the fore-and-aft rigging allowed for fast, efficient operation. Bates's design received the highest possible praise from other shipbuilders on the lakes. They copied it shamelessly.⁹⁰

There was another type of sailing ship that was common, although it was pretty roughhewn in comparison to Bates's clippers. The scow schooner was little more than a scow equipped with a schooner rig. Flat bottomed, boxy, with a blunt bow and stern, and vertically planked sides, these were vessels that did not require a skilled shipwright to construct. Carpenters or coopers in new settlements could knock one together in a few weeks. Built at Erie, Pennsylvania, the first one cast off in 1825, after that the style spread throughout the region. Often they were a new lakeshore community's first venture into commerce and a critical link to the outside world. Their flat bottoms made them easy to load with heavy bulk cargoes. That feature also made them easier to pull over a sand bar blocking a potential harbor, or if they grounded on a shoal. Insurance underwriters were leery of them because of their poor sailing qualities in the face of a gale on the open lake, but they served an important niche in the Great Lakes economy into the start of the twentieth century.⁹¹

Between the sleek clipper schooners and the homely scows were the "canalers." These were schooners adapted to fit the requirements of the Welland Canal that bypassed Niagara Falls through Upper Canada's Niagara Peninsula. The locks on the original canal were only 110 feet long, and the 1848 expansion was still limited to 150 feet. Hence ships designed to pass from Lake Erie to Lake Ontario had a stunted appearance with small bowsprit and a snubbed taper to the stern. Canalers had a bad reputation among men who worked lake schooners. They had a bad habit of slipping when sailing before the wind. It was a habit that under the wrong conditions could get a sailor killed.⁹²

Although steamboats made wakes on Lake Ontario as early as 1816 and on the Upper lakes in 1818 with the *Walk-on-the-Water*, it was not until the 1830s they began to have a major impact on the region's burgeoning trade. By 1833 there were eleven paddle wheel vessels serving the lakes. In short order, they took over the passenger trade. The ability of these vessels to run on something like a schedule, not being dependent upon the whims of the wind, made them popular with families migrating west. Compared to the cramped below decks quarters offered on sailing vessels, the steamers often had main deck cabins, and after 1839 second tier cabins that offered fresh air, light, and easy access to the deck. In time so-called "palace steamers" joined the vessels serving the eight-day Buffalo to Chicago route. Opulent salons for men as well as separate spaces for women and children to relax, cabins attended by

90 Howard Chapelle, *The History of American Sailing Ships* (New York: W.W. Norton, 1955), 219-49.

91 Keith N. Meverden and Tamara L. Thomsen, *Wisconsin's Cross-Planked Mosquito Fleet: Underwater Archaeological Investigations of the Scow Schooners Iris, Ocean Wave, and Tennie and Laura* (Madison: Wisconsin Historical Society, 2005), 8-12.

92 Arthur B. Strough, "Crews of Early Great Lakes Vessels," *Inland Seas* Vol. 48, No.2 (1993), 258-60; Karamanski, *Schooner Passage*, 31-32.

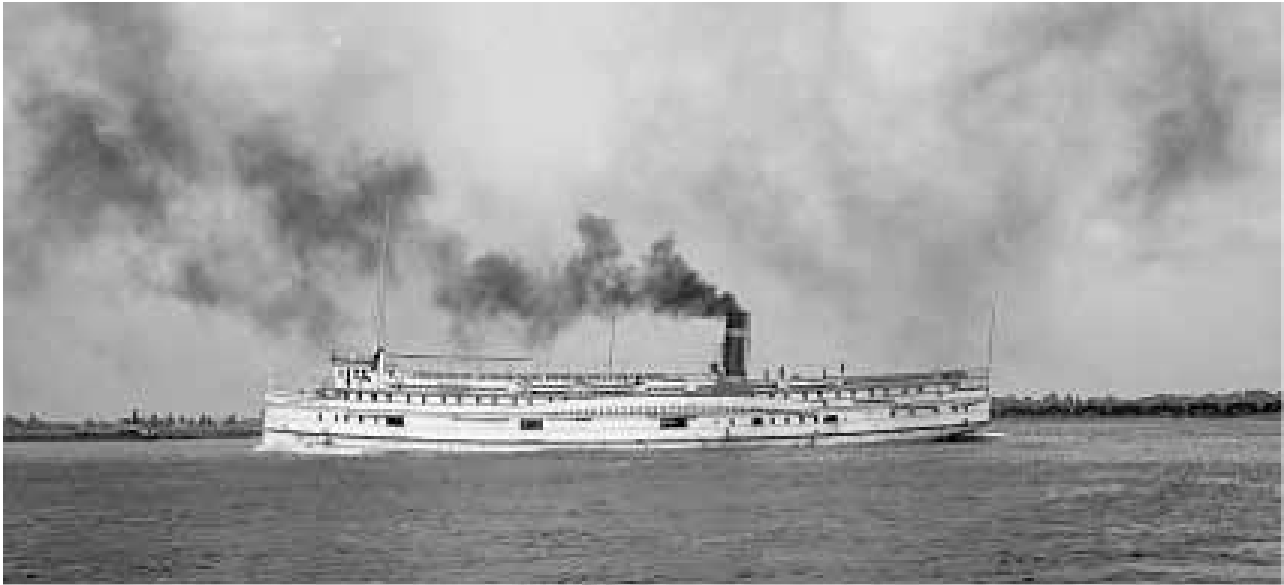


Figure 10. A Great Lakes propeller steamer, the *United Empire*.

dutiful stewards and stewardesses, and handsome dining facilities made these boats the match for the best hotels of the day. More common were the working boats that mixed passenger service with cargo and catered to immigrant travelers. One traveler described his fellow passengers as a “Congress of Nations.” Looking about the upper deck he saw, “hardy country-loving Swiss; the drawling, drudging Dutchman; the persevering, opinionated Scotchman; and the reckless, roistering Irishman, as well as the shrewd and penetrating Yankee...tumbled in admirable confusion, person and effects.”⁹³

Unlike the familiar steamboats in service on rivers the lake vessels had their engines amid ship and the giant paddle-wheels were positioned one each on the starboard and port sides. After 1841 a better propulsion method was gradually adopted, the screw propeller. Perfected by the Swedish inventor John Ericsson, who would later win fame as the inventor of the ironclad warship the *Monitor*, the development of propeller propulsion was one of the great maritime innovations. Paddlewheels would continue to be built and used for many years. However, the propeller would eventually dominate all the oceans of the world. This innovation was first perfected on the Great Lakes, nearly two years before it debuted on salt water. In November 1841 a ninety-foot long sloop rigged steamer named the *Vandalia* powered its way out of Oswego harbor. The new design moved the engine to the stern of the vessel and a smoke stack projected from the deckhouse. *Vandalia* was well-tested on her maiden voyage by both calm and heavy seas and she performed admirably. Within two years the first propellers made their appearance on the upper lakes when *Samson* and *Hercules* were launched from Lake Erie shipyards.⁹⁴

Steamers shaped both the early settlement pattern of the Great Lakes region as well as its environment. The vessels’ fire boxes devoured a tremendous quantity of wood. A steamer voyaging from Buffalo to

⁹³ Thompson, *Graveyard of the Lakes*, 51-52; James P. Barry, *Ships of the Great Lakes: 300 Years of Navigation* (Holt, Mich.: Thunder Bay Press, 1996), 45.

⁹⁴ Frank R. Rossel, “The *Vandalia*, First Great Lakes Propeller,” *Marine Review*, (September 1917), 338-39. There was an earlier propeller driven craft before *Vandalia*. The English-built *Francis B. Ogden*, however, was only a small launch; Arthur Pound, *Lake Ontario* (New York: Bobbs-Merrill, 1945), 322.

Chicago would consume six-hundred cords of wood. That amount of fuel was the equivalent of ten acres of dense forest. Every other day a vessel would be required to stop and refuel. Established ports of call such as Cleveland, Detroit, and Mackinac Island had only limited access to the vast amount of cordwood required by the numerous steamers. Special fuel stations were established all along the waterways. These were sites situated so vessels could easily and safely access them, and they had to be adjacent to large stands of timber. This led to entrepreneurs establishing isolated settlements on the peninsulas and islands along steamship routes. In the twenty-first century, islands like Beaver Island and South Manitou Island are among the most remote places on the Great Lakes, but in the nineteenth century the needs of lake commerce made them some of the first areas to be settled.⁹⁵

The proliferation of steamers on the inland seas by no means diminished the importance of sailing vessels. Throughout the nineteenth century, sail maintained a critical place in marine commerce. In 1872, for example, there were 682 steamboats plying the lakes yet 1,654 sailing ships, mostly schooners, remained in service. The niche occupied by schooners was in transporting bulk cargo. The overwhelming majority of the immigrants taking steamships west were destined to be prairie farmers. They left their homes in rocky-soiled New England or the socially static Old World determined to improve themselves economically by becoming market farmers. A golden stream of grain, beginning as a trickle in the late 1830s and building to a flood, thereafter, flowed from their homesteads and into the holds of Great Lakes schooners. Canals such as the Ohio and Erie, the Wabash and Erie, and the Illinois and Michigan played a critical role diverting this flow from river towns such as St. Louis and toward the Great Lakes-Erie Canal route.⁹⁶

Another key innovation along with these artificial rivers was the grain elevator. Today there are few more prosaic and ignored structures than the humble grain elevator. But in the nineteenth century, they were technological marvels and the tallest, proudest structures in Chicago and Buffalo. The honor for inventing these commodity towers goes to Buffalo. The city was the terminus of lake navigation, and in 1842 Joseph Dart, a warehouse operator there, was being buried with sacks of grain. He needed more storage space but harbor frontage was expensive. Moving the sacks from ship to warehouse to canal boat was labor intensive and wasteful. Grain sacks would break and their contents would litter the warehouse and docks. Dart devised a vertical storage system in which the grain was liberated from the cloth bags and moved in a massive stream of individual kernels of corn or wheat. Instead of a procession of stevedores with sacks of cereal, steam powered conveyor belts brought the grain into and out of the elevator. Chicago's Board of Trade refined the system further by introducing a standardized grading system that established the quality of grain and opened a market in current as well as future grain prices, which was the basis for today's commodity markets. This new Great Lakes system for marketing and transporting grain easily bested the slow laborious approach to commodities in the old

⁹⁵ Thurlow Weed, "A Trip to Chicago and the Lake Harbor Convention," *Chicago River and Harbor Convention*, ed. by Robert Fergus (Chicago: Robert Fergus, 1882), 149.

⁹⁶ Mansfield, *History of the Great Lakes*, 439; Karamanski, *Schooner Passage*, 59-60.

river-centered grain ports of St. Louis and New Orleans. Illinois, Indiana, and Ohio grain that once made its way to market via the Mississippi River was now directed to the harbors on the inland seas.⁹⁷

Of course, elevators could only drop their streams of grain into the hold of a ship if the ship could be docked under its spout in a genuine harbor. This was true of Chicago and eventually Milwaukee, Toledo, and Cleveland. It was not true of towns that failed to receive harbor funds before such improvements were cut off by the Democratic Party. Wisconsin ports were a case in point. During the 1850s immigrants flocking to the state increased the amount of improved acreage by a whopping 260 percent. During that decade Wisconsin alone accounted for a 15 percent increase in American wheat production. Farmers laboriously brought their harvest over unimproved roads to the closest lake port. At Racine, Kenosha, and Sheboygan grain often had to be loaded from large elevators into bags, and the bags then put on lighters that could ferry the grain out to the schooners where sailors then had to place the sacks in the ship's hold. To load a typical three-masted grain schooner, it took three lighters filled with sacks. Had those vessels been able to enter a port and dock underneath an elevator, the process would have taken a matter of minutes. So difficult was it to get Wisconsin grain to eastern markets, that ante-bellum merchants often found it more economical to send a significant portion of the harvest west to the Upper Mississippi frontier where the fur trade and lumbering held sway.⁹⁸

Hazards of Ante-Bellum Lake Navigation

Great Lakes shipbuilders such as William Wallace Bates designed vessels that were well-suited to shallow, sometimes unimproved harbors while at the same time capable of moving large amounts of grain from west to east. During the shipping season, fleets of these white-winged craft were constantly in motion from Lake Michigan or Erie ports to Buffalo. Their return cargoes varied from manufactured goods to bulk items such as coal. Lake Superior ports shipped copper and iron ore. The latter was loaded directly into the holds of schooners from large ore docks that projected into the lake. The building of the first of these ore docks at Marquette in 1859 pretty much assured schooners of the iron ore trade because the deck cabins on steamers prevented direct access to their holds. The steamers flourished, however, with the passenger trade. It would not be for another decade before new specialized steamers were designed to secure their share of the trade in bulk cargoes.

The importance and financial success of lake shipping, however, did not mean the trade was not dangerous. Too few lighthouses, the lack of effective charts, and the stoppage of harbor improvements all contributed to numerous shipwrecks on the inland seas. Isaac Stephenson, a ship master and later a major lumberman, argued;

Sailing a ship was not unlike blazing a way through the forest. With conditions wretched as they were the navigator was practically without charts and the master figured his course as nearly as he could, estimating the leeway and varying influence of the winds.

⁹⁷ Joseph Dart, "The Grain Elevators of Buffalo," *Publications of the Buffalo Historical Society*, Vol. 1, (1879), 391-404; William Cronon, *Natures Metropolis: Chicago and the Great West* (New York: W.W. Norton, 1991), 110-11.

⁹⁸ Patrick E. McLear, "Rivalry Between Chicago and Wisconsin Lake Ports for Control of the Grain Trade," *Inland Seas*, Vol. 24, No.3 (1968), 225-31; also see Patrick E. McLear, "The Rise of the Port of Chicago, to 1848," (M.A. Thesis, University of Missouri, Kansas City, 1967).

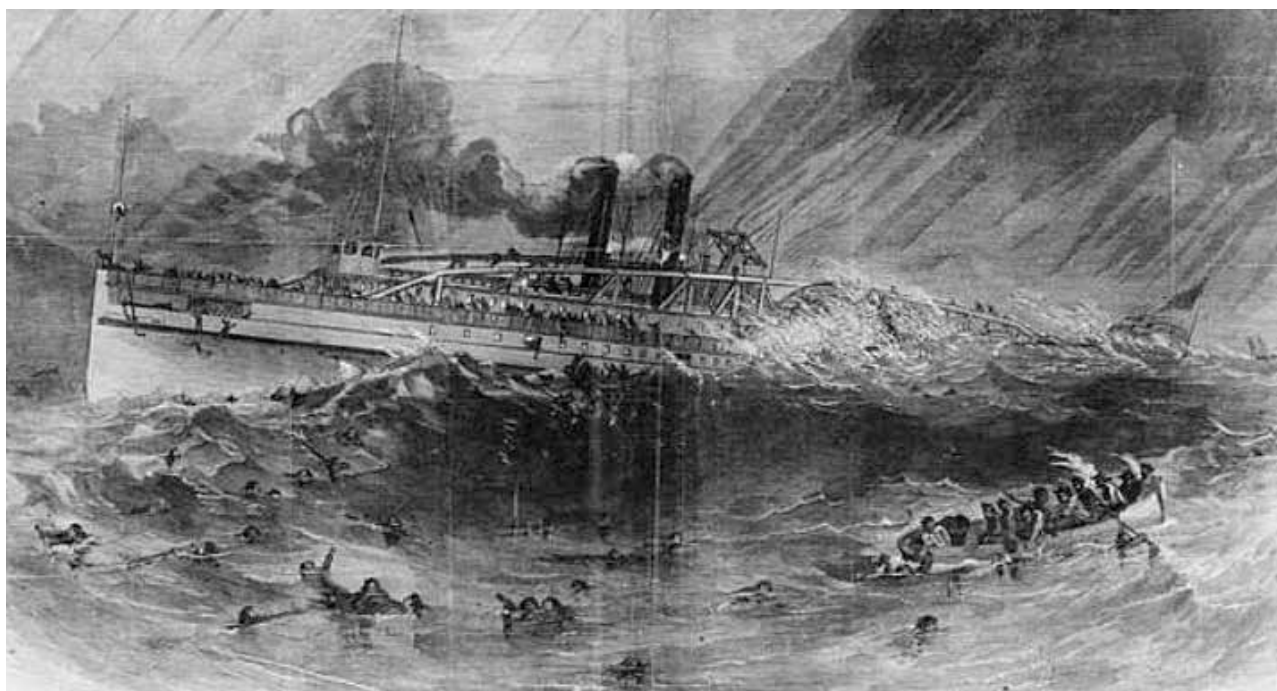


Figure 11. The wreck of the steamer *Lady Elgin*, 1860.

The fate of steamboats, the most technologically advanced branch of the lake marine, illustrates the risks involved. Between 1816 and 1871, 216 steamboats were built and operated on the Great Lakes. More than half of these vessels were lost to mishaps. Sixty-nine of the steamers were lost in storms or groundings taking with them at least 136 lives. Thirty-four of the ships burned killing more than 700 passengers and crew. One of the worst of these was the 1847 disaster that destroyed the ill-named *Phoenix*. The 155-foot vessel was loaded with 275 Dutch immigrants as well as other passengers and crew. Overheated boilers set the vessel afire and the panicked people had the awful choice of dying from the smoke and flames or the ice cold waters of Lake Michigan. Two small lifeboats saved a handful while 258 souls perished. Collisions accounted for the sinking of only twelve steamers but the loss of 601 lives. The bulk of those fatalities occurred in September 1860 when the elegant steamer *Lady Elgin* collided with a lumber schooner. The encounter could have easily been avoided had there been established “rules of the road” to govern the conduct of passing vessels. The lack thereof that night cost between 279 and 350 lives.⁹⁹

The Jacksonian laissez-faire approach to the economy accounted for some of these losses. There was an almost complete lack of regulation of the lake marine. Steamboat explosions on the Great Lakes as well as on the Mississippi River were all too common with boiler explosions accounting for hundreds of deaths or hideous scaldings per year. An attempt by Congress to address the issue in 1838 was feeble and totally ineffective. Finally, in 1852 Congress took action with “An Act to Provide for Better Security of the Lives of Passengers on Board of Vessels Propelled in Whole or in Part by Steam.” The

⁹⁹ J.W. Hall, *Marine Disasters on the Western Lakes During the Navigation of 1871 With the Loss of Life and Property With a Sketch of Early Marine History* (Detroit: Free Press Job Printing Office, 1872), 5; Stephenson, *Recollections of a Long Life*, p.93 Thompson, *Graveyard of the Lakes*, 99-101; Karamanski, *Schooner Passage*, 201-4.

legislation set up a system by which boilers were inspected every other year and engineers were to be licensed. Less effective were its guidelines for lifeboats, life preservers, and fire-fighting equipment. Prior to this legislation an estimated 7000 people had died on unregulated steamboats. The federal Steamboat Inspection Service made a healthy inroad into the litany of disasters on inland waterways. It did not, of course, stop all boiler explosions. In 1860 the steamer *Globe*, securely berthed in the Chicago River, blew up with the loss of fifteen lives.¹⁰⁰

Storms were the greatest threat to shipping. The power of wind and waves magnified exponentially the dangers posed by unimproved navigation on the lakes. In fair weather a schooner or steamer could manage without harbors of refuge, make port without the aid of pier head lights, and even overcome grounding on hidden shoals. In heavy seas, these issues became lethal. In 1838 a severe November gale seriously damaged twenty-five ships, mostly schooners. A worse storm struck in November 1842. It raged across Lakes Michigan, Erie, and Ontario with winds estimated to top seventy miles per-hour. In its wake more than fifty ships were wrecked and better than one-hundred lives lost. Worse came in 1860 when 578 people died in shipping related accidents. The fact that lake shipping was a seasonal affair from early May to mid-November made the number of these losses all the more noteworthy.¹⁰¹

Navigation of early Great Lakes vessels was not a science, rather an art perfected by experience. Accurate charts were slow to become available and were not readily in use until the mid-1850s. Sailing as a passenger in 1836 the British social reformer Harriet Martineau commented: "The navigation of these lakes is, at present, a mystery. They have not yet been properly surveyed. Our captain had gone to and fro on Lake Huron, but had never before been on Lake Michigan; and this was rather an anxious voyage to him." In unknown waters he had not traveled eighty miles before he ran his ship on to a sand bar that took the better part of a day to get off. Fortunately the weather was calm. In a gale the grounding could have meant death for his passengers and crew.¹⁰²

As early as the late eighteenth century, the British government funded surveys of key points along the Great Lakes, but functional charts were not developed. Captain George Mann, a military engineer charged with conducting the surveys, observed most vessels remained within sight of land "the Navigation must be considered chiefly as Pilotage, to which the use of good Navigational Charts are essential, and are therefore much wanted." A generation later royal officials still only had a sketchy knowledge of large portions of the lakes. In 1816 William Owen reported to the Royal Navy that: "of navigation of Lake Huron scarcely anything is known. To the southward of the Manitoulin Islands, it is said to be clear of dangers, and to the northward to be intricate and full of them." Armed only with word-of-mouth or hard-won experience vessels had to feel their way down the lakes with considerable caution using the navigation technique known as dead-reckoning. Captains set their course on

100 Walter Johnson, *River of Dark Dreams: Slavery and Empire in the Cotton Kingdom* (Cambridge, Mass.: Harvard University Press, 2013), 107-19; United States Congress, "An Act to Provide for the Better Security of the Lives of the Passengers on Board Vessels Propelled in Whole or in Part by Steam," 32nd Congress, 1st Session, 2-11; *Chicago Tribune*, 12 January 2003.

101 Thompson, *Graveyard of the Great Lakes*, 210.

62 102 Harriet Martineau, *Society in America*, Vol.2 (London: Saunders and Otley, 1837) p.6.

compass bearings from one familiar headland to the next and estimated their sailing time by using a patent log or taffrail log to measure the ship's speed. A taffrail log was a small brass device with blades that turned in the water. A sailor would throw it over the stern, and as the attached line played out, he would count the knots in the cord and thereby calculate how fast the vessel was going. Each knot was estimated to be a little less than a mile-per-hour. The frustrations of this type of navigation are illustrated by the log of Captain S.G. Gibbs. In 1856 he was taking the schooner *Augusta* east across Lake Erie when he encountered thick fog. The sailing ship was bound for the Welland Canal. The night before the captain had taken a bearing from Point Rondeau on the north shore of the lake. At dawn he peered anxiously through the fog for a new landmark. "We saw land but could not tell how far down we got," he wrote in the log. All day long he proceeded cautiously. As evening approached he became concerned about how close he was to shore, and he began to take depth soundings. His last bearing had been about 140 miles from the canal and somewhere between him and the canal was a long narrow peninsula known as Long Point that reached far out on to the lake. When his soundings revealed the depth had decreased to only five fathoms, he changed to a course that would take him parallel to the peninsula, if indeed that point was ahead of him in the fog. The next morning the skies were clear, visibility excellent, and he was able to recognize his position from the features of the shore. Before noon he safely reached the first Welland lock.¹⁰³

Even after charts were readily available dead reckoning was important to navigation. In May 1876 Captain Timothy Kelly piloted the schooner *Thomas Howland* down a foggy Lake Huron. He noted: "at 5 AM thought was about abreast of Point Aux Barks, at 6 AM hauled in the log [he had set it when abreast of Thunder Bay] at 6 AM ran 67 miles by logs miles." By these calculations and occasional depth measurements, he could compare with the charts he knew he was approaching the end of the lake and by 11 AM he was able to "pick-up" a St. Clair tow. Lighthouses were important to this type of navigation as they were fixed reference points upon which navigators could take bearings or locate their position. Ship's log books were filled with notations such as "fog cleared up a little and made Chicago Light right ahead," or "took bearings on ducks light [Duck island Light]," or "left Cheboygan could hear Spectacle Reef fog whistle all the PM." Before schooner captain Timothy Kelly, who had grown up sailing Lake Michigan, set sail on his first voyage to Lake Ontario, he noted in his log the lighthouses with their flash signatures between the Welland Canal and the port of Kingston. Also noted were the appropriate compass bearings that would ensure a safe course of travel between each. U.S. Lake Survey charts contained sailing directions, which may have been where Kelly got the information. Eventually, the survey produced detailed pamphlets containing sailing directions for all of the lakes. These indicated the proper compass bearings to guide vessels from headlands, to lighthouses, to buoys, and hence to their desired port-of-call. Of course, for a sailing ship skipper to

103 J.P.D. Dunbabin, "Motives for Mapping the Great Lakes: Upper Canada, 1782-1827" *Michigan Historical Review*, Vol. 31, No.1, 1-43; Paul H. Gibbs, ed., "Extracts from the Log of the Schooner *Augusta* April to November, Captain S.G. Gibbs, Master, Sailing Season of 1856," *Inland Seas*, Vol. 45, No. 2, (Summer 1989), 117-30.

maintain a fixed compass heading was extremely difficult when the wind was variable and shifting, as it often was on the Great Lakes. Monitoring how much the vessel strayed on each tack was part of the art of lake navigation.¹⁰⁴

Vessel masters operating in familiar waters on regular runs, such as the lumber schooners that crisscrossed Lake Ontario and Lake Michigan, did not make use of anything more elaborate than a compass and a chart. Masters less familiar with the waters they sailed on, bound on journeys that would last multiple days, took other precautions. John Kenlon was made the master of the three-masted schooner *Resumption* because of his decade of salt-water experience including a passage of Cape Horn. Before setting out on his first lake voyage from Chicago to the head of Green Bay, he went to a pawnshop and purchased a "very fine set of charts of the Lakes" and "an old sextant." The vessel owners who agreed to cover the cost of navigational tools did not give him enough money to buy a good chronometer so he resolved to simply use his pocket watch. After a day and a night which included a gale, Kenlon used his "crude instruments" to "take a sight and ascertain our position." This gave him a good idea he was near the entrance to the bay. However, he was not certain until he could verify his position "by bearings on shore." It is safe to say that most schooner captains trusted visual bearings more than navigational instruments.¹⁰⁵

In the early 1840s Great Britain's Canadian colonies received a loan of 1.5 million pounds to improve roads, expand the Welland Canal around Niagara Falls, and to make the St. Lawrence River navigable for lake shipping. Not only would these improvements open the Great Lakes to Royal Navy vessels in time of war—a major consideration at the time—but it opened up the possibility that Montreal could become the logical destination of the trade of the American West. An 1843 Congressional investigation warned that British support for navigation improvements threatened to make the Western states "colonies" of the crown in all but name. Yet even such a prospect did little to stir vigorous legislative action. President Tyler signed a modest improvement bill that year, but it only included minor work for three Lake Michigan ports.¹⁰⁶

Lake sailors and their families had little choice but to accept and deal with the dangerous conditions under which the necessary and lucrative trade took place. In 1842 famed novelist Charles Dickens noted that river steamboats seemed to explode at least once a week, but it did not stop him from touring the Ohio Valley from the deck of a paddle-wheeler. On the lakes immigrants bound for the West were happy to be able to get their families six-hundred miles into the interior of the continent in as little as a week of travel. People who lived in isolated settlements deeply appreciated the regularity of steamboat arrivals and departures. "No one but those who reside on an island can appreciate the

104 Timothy Kelly, Log of the *Thomas Howland*, 1876, Box 84, Timothy Kelley Papers, Wisconsin Maritime Museum, Manitowoc, Wisconsin; Timothy Kelly, Log of the Schooner *C.L. Johnson*, 1872, Box 76A, Timothy Kelly Papers, Wisconsin Maritime Museum; Kelly Diary, 1873, Box 76A, 15 November 1873, Wisconsin Maritime Museum. United States. Hydrographic Office, *Sailing Directions for Lake Erie and Lake Ontario, St. Clair and Detroit River and Lake St. Clair* (Washington, D.C.: U.S. Government Printing Office, 1896).

105 John Kenlon, *Fourteen Years A Sailor* (New York: George H. Doran Company, 1923), 194-98.

64 106 United States Congress, Senate, *Report of the Committee of Commerce*, Senate Document, No.234, 27th Congress, 3rd Session, 1843, 9.

steamboat service or what it means to people,” wrote a Beaver Island resident. “We learn to love the boats, the sound of the whistle even in the midnight hours was music in our ears and brought cheer and comfort to our hearts.” Yet a life before the mast was a life of risk. Elizabeth Whitney Williams who helped keep the lighthouse at Beaver Island and later at Harbor Springs—both on Lake Michigan—was the daughter of a lake mariner. Her three brothers became sailors. Two of them and three nephews “found graves beneath the deep waters, but mine was not the only sorrow,” she wrote in her memoir. “Others around me were losing their loved ones on the stormy deep and it seemed to me there was all the more need that the lamps in our light-house towers should be kept brightly burning.”¹⁰⁷

The River and Harbor Convention of 1847

In July 1847 the infant city of Chicago held its largest Independence Day celebration. The city of 16,000 people was at a critical juncture in its history. The long delayed Illinois and Michigan Canal connecting Lake Michigan to the Mississippi River system was finally on the brink of opening. Economic hopes were high. The town was jammed with visitors, somewhere between 4,000 and 10,000. To impress them, the City Council had approved spending \$5,000 on patriotic floats for the parade. The most impressive by far was of a fully rigged sailing ship with jack tars aloft in the rigging set on wheels and pulled by a heavily labored team of horses. From the ship flew a banner depicting a storm tossed sea and a “lighthouse lifting its star of joy and hope” marking a safe harbor for the beleaguered sailor. Emblazoned on the banner were the words “What we Want!” The sentiment was greeted with great cheers for it perfectly captured the reason so many people from across the United States had come to Chicago. The next day the largest political gathering up to that point in U.S. history began its formal sessions to demonstrate their support for improved navigation on the Great Lakes.¹⁰⁸

Throughout the 1840s western Congressman pressed their colleagues in the House and Senate to invest in more lighthouses, to chart the lakes, and to improve the region’s harbors. The latter issue was by far the most expensive and controversial. Nonetheless, careful fence-mending between legislators, who wanted federal aid to navigation on the Great Lakes, and those who wanted help with a variety of river projects led to a coalition that successfully pushed through Congress the Rivers and Harbors Bill of 1846 . It authorized the federal government to spend \$500,000 on needed projects. It embraced appropriations along the entire Great Lakes-Erie Canal east-west transportation corridor, including \$75,000 for the Hudson River, \$72,000 for Lake Ontario harbors, more than \$170,000 for Lake Erie improvements, and \$160,000 for Lake Michigan projects. Democratic and Whig legislators worked together to craft the bill, and many a congratulatory toast was shared when it was approved by both Houses of Congress.¹⁰⁹

¹⁰⁷ Elizabeth Whitney Williams, *A Child of the Sea; And Life Among the Mormons* (St. James, Mich.: Beaver Island Historical Society, 1983), reprint of 1905 edition, 215-16.

¹⁰⁸ *Chicago Evening Journal*, 5 July 1847 quoted in Mansfield, *History of the Great Lakes*, 202.

¹⁰⁹ Mansfield, *History of the Great Lakes*, 201; Mentor Williams, “The Chicago River and Harbor Convention, 1847,” *Mississippi Valley Historical Association*, Vol. 5, No.4, (March 1949): .607-26.

Celebrations, however, proved premature. On August 3, 1846, President James K. Polk vetoed the bill. Polk fancied himself the successor to the mantle of Andrew Jackson. They both hailed from Tennessee, both were Democrats, both were highly partisan. Jackson was known as “Old Hickory.” Polk was dubbed “Young Hickory.” Jackson had used the presidential veto power more times than any previous president—often to block internal improvement projects. Polk modeled his veto of the River and Harbors Act on Jackson’s earlier veto of the Maysville Road. Polk decried the appropriations as “local in character.” He complained that Great Lakes harbors hardly deserved the name as they were not “connected with foreign commerce, nor are they places of refuge or of shelter for our navy or commercial marine on the ocean or lake shores.” He dismissed the inland projects as “unimportant” and the appropriations as both unconstitutional and subversive of public virtue.¹¹⁰

In Congress dismayed legislators scrambled to build support to override the veto. Party discipline forced some Democrats initially in favor of the bill to sustain President Polk. The core of opposition, however, came from Southern representatives. William L. Yancey of Alabama organized support for Polk in the House of Representatives. In later decades he would be one of the leading firebrands that stampeded the South into secession and Civil War. He favored a limited federal government that neither played a role in improvements nor could it threaten slavery. George Houston, another Alabama Congressman, took a more parochial view. “What interest have my constituents in improvements of the Hudson River; the canals and harbors of Illinois, Indiana, or Michigan,” he asked. Western Congressmen warned their Southern colleagues that this issue would alienate people in the West and destroy the informal political alliance that had long prevailed between the sections. Yancey blustered that such threats “can have no influence over a single vote I have to give....I fear not the West.” The press accentuated the growing sectional divide. A Chicago newspaper saw the issue in the same stark terms: “This harbor question is not a political one, it is a sectional one. It is one between North and South.” Polk’s veto came at a time when he had requested more funds to sustain the war against Mexico—a conflict many Northerners saw as being waged to expand slavery. The *Chicago Daily Journal* scoffed at Polk’s claims of fiscal restraint and limited government: “Are not millions being squandered by the same James K. Polk for the invasion of Mexico and the extension of slavery? Are not the Treasury doors unbarred whenever the ‘open sessme’ is whispered by the slave driver?” Yet nothing solidified the Southern Congressional block like a mention of the word “slavery.” When put to a vote, the override failed by a 96-91 margin. Southern Congressmen were nearly unanimous in support of Polk’s veto voting 43-1 to sustain the president. The sectionalism of the issue was obvious to all.¹¹¹

These actions set the stage for the unprecedented political gathering in Chicago in the summer

110 Mansfield, *History of the Great Lakes*, 20; Robert W. Merry, *A Country of Vast Design: James K. Polk, The Mexican War, and the Conquest of the American Continent* (New York: Simon & Schuster, 2009), 282-83.

111 Paul Paskoff, *Troubled Waters: Steamboat Disasters, River Improvements, and American Public Policy, 1821-1860*, (Baton Rouge: Louisiana State University, 2007), 63-72; Merry, *A Country of Vast Designs*, 283; Joshua Saltzman, *Safe Harbor: Chicago's Waterfront and the Political Economy of the Built Environment, 1847-1918*, (Ph.D. Dissertation, University of Illinois at Chicago, 2008), 34.

of 1847. The goal was to bring together politicians, opinion-makers in the press, and representatives of the many commercial interests engaged in inland trade to express their “indignation” over Polk’s actions and to build an alliance to force federal support for internal improvements. The gathering was so big there was no building large enough in the city to hold the convention, and a giant tent had to be erected. Under its canvas cover delegates from eighteen states vied with themselves to refute Polk’s contention that, while there was a national interest in navigational improvements along the Atlantic and Gulf Coast, such improvements in the interior were purely “local” in character. Young Abraham Lincoln made his first foray onto the national political scene when the lanky lawyer, in an ill-fitted suit, attacked the notion that federal support for harbors was somehow unconstitutional. Other future leaders of the Republican Party were also present including Thurlow Weed, Edmund Bates, and Horace Greeley. Few Southern delegates were present and none of any reputation. Duff Green, a Missouri entrepreneur and Democratic Party insider, urged John C. Calhoun, the champion of the South and slavery, to attend. Calhoun still nursed the ambition to be elected president. Green warned Calhoun that the Chicago Convention would “do much to control the future destiny of this country.” Green predicted, “If the South opposes all appropriations for Harbors and Internal Improvements, the Great West will unite with the East, and carry measures against the South. In that case Abolition and Internal Improvements go together & strengthen each other.” Calhoun rejected this advice. Typical of the South’s reaction to the Convention was a Jackson, Mississippi, newspaper’s dismissal of the proceedings as “humbuggery.” Time would prove such a reaction costly as an anti-slavery-internal-improvements alliance came to be.¹¹²

The Convention helped to spark a revolution in the economics of Great Lakes trade. The work of organizing the event; as well as the bootstrap efforts of Boards of Trade in Chicago, Milwaukee, and other towns in the region to keep their harbors open through privately financed dredging; and their lobbying for federal support all helped to build cooperation between merchants. These bonds of trust and common interest eventually led to a new system for marketing Western grain. Previously, grain was shipped from Lake Michigan or Lake Erie ports and sold in New York along the same lines as if it were foreign trade. Drafts were drawn by Western grain merchants on New York banks. These same drafts could be used to secure advances from local banks to continue operations while awaiting payment from New York. This precarious method of operation resulted in hardship when financial hard times hit as they did in 1857. The panic that year pushed Western grain merchants to move to a new system built on their cooperation over the previous decade. The Board of Trade in Chicago, followed by other smaller organizations, developed a workable system of standard grades of grain, and put in place a trustworthy network of inspectors that made it possible to sell grain to Eastern buyers before the product was ever loaded into the hold of a schooner. This gave producers an even flow of income and

¹¹² Robert Fergus, editor, *Chicago River and Harbor Convention* (Chicago: Fergus Printing Company, 1882), 138, 141 ; Duff Green to John C. Calhoun, 31 May 1847 quoted in (Marc Egnal, *Clash of Extremes: The Economic Origins of the Civil War* (New York: Hill & Wang, 2011), 117-18 ; *The Mississippian* (Jackson), 23 July 1847.



Figure 12. Millard Fillmore

Eastern buyers could set contracts for future delivery. This tended to stabilize prices and reduce the credit risks of Western grain dealers. By the mid-1860s this system was the basis for the creation in Chicago of a “futures” market in commodities. Although, in later years, hedging and other marketing techniques initially designed to reduce risk led to unregulated speculation.¹¹³

The 1847 Convention was also the beginning of a political revolution. Polk’s veto of the River and Harbor Bill awoke the nascent political consciousness of the Old Northwest region, solidified the region’s political-economic relationship with the Northeast, and sundered much of the goodwill and cooperation that had existed between the West and the South. Although Polk’s veto was sustained, the Chicago Convention

spurred Congress to draft and the House to approve an even larger river and harbor bill in 1847. The House Committee on Commerce clearly mirrored the Convention when it openly challenged the logic of the President’s veto message as “casuistry...[that] can distinguish between the power to erect and maintain a light-house to guide the mariner by or around an obstruction, and the power to remove the obstruction itself.” Harbor appropriations were a significant issue in the 1848 presidential election. The Democrats remained categorically opposed on Constitutional grounds. The Free Soil Party, a third party upstart that focused on restricting the spread of slavery, and the Whigs, the party of the American System, endorsed improvements. The victorious Whig candidate was war hero Zachary Taylor and his Vice President Millard Fillmore. The latter was a lawyer from Buffalo, New York, who had been active in the promotion of the Chicago Convention and was a strong supporter of internal improvements. In fact, it had been Polk’s veto that prompted Fillmore, who had previously been a member of Congress, to reenter politics. When President Taylor died suddenly in the summer

¹¹³ Thomas Odle, “Entrepreneurial Cooperation on the Great Lakes: The Origin of the Methods of American Grain Marketing,” *The Business History Review* Vol. 38, No. 4, (Winter 1964): 439-55.

of 1850, supporters of federal navigational aids and harbors finally had a spokesman in the nation's highest executive office.¹¹⁴

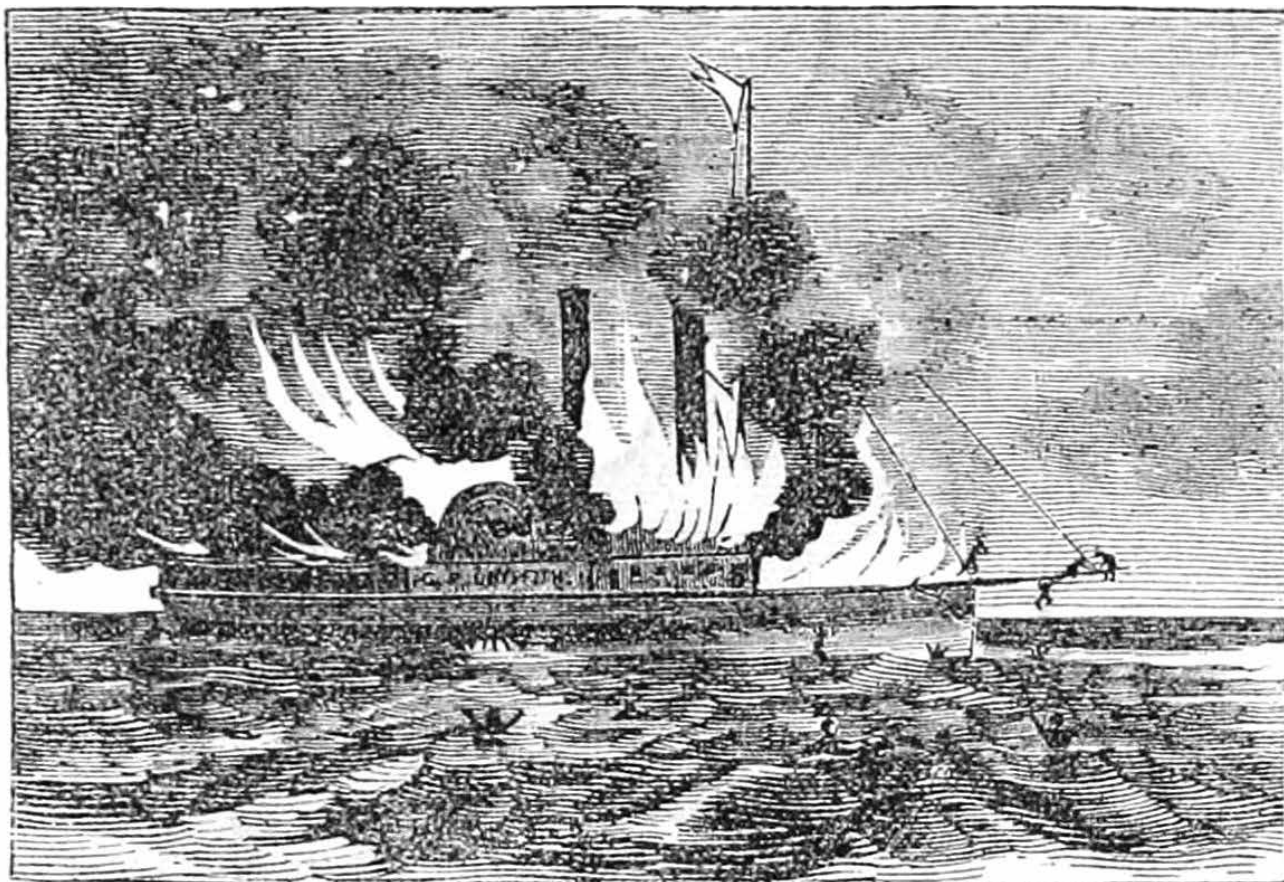
Fillmore came into his high office with the nation in political crisis over the issue of slavery in the territories won in the recent war with Mexico. Only the Compromise of 1850, which was ushered through Congress just after Fillmore took office, headed-off secession by slave holding states. Implementing the carefully balanced set of policies bundled into the Compromise was Fillmore's first order of business. Internal improvements, however, was never far from his mind. In his first annual address to Congress in 1850, he went out of his way to make it clear that he did not regard the Constitution as an impediment to safe navigation. He based his case on the so-called "commerce clause" of the Constitution under which all "light-houses, buoys, and beacons" along the nation's seacoast had been "established and floating lights maintained" and "harbors have been cleared and improved, piers constructed, and even breakwaters for the safety of shipping and sea walls to protect harbors...have been erected at very great expense...Nor do I perceive any difference between the power of Congress to make appropriations for objects of this kind on the ocean and the power to make appropriations for similar objects on lakes and rivers, wherever they are large enough to bear on their waters an extensive traffic." Unfortunately for Fillmore and his internal improvements agenda, the Democrats controlled both the Senate and the House of Representatives, which made moving from words to action difficult.¹¹⁵

While sectional conflict consumed Congress's attention in 1850, maritime commerce on the Great Lakes had its most disastrous year yet. The greatest tragedy in the calamitous year was the June sinking of the steamer *Griffith*. She was out of Buffalo coasting the south shore of Lake Erie on her way to Toledo with a large number of passengers, including 256 immigrants in steerage, when the vessel caught fire. Captain C.C. Roby immediately steered the ship toward shore and nearby Cleveland harbor. The 400-ton vessel unfortunately struck a hidden sand bar and became hard stuck just as the flames began to spread. There was no hope for the passengers but to plunge into the cold lake. It was estimated that at least 300 persons perished. The *Griffith* was only one of the eleven steamboats lost that year. Losses were heavier among the sailing vessels. Twenty-one were lost during the navigation season. The total property loss on the lakes that sad season was \$558,926. More importantly 431 sailors and passengers lost their lives. The 1851 season continued the mounting toll. Only seventy-nine lives were lost but property damage exceeded \$730,000. That increase was part of a steady escalation of the loss of property on the lakes. Between 1848 and 1855 financial losses to Great Lakes ships increased from \$404,830 to \$2,797,839.¹¹⁶

114 Mentor Williams, "The Chicago River and Harbor Convention, 1847," *Mississippi Valley Historical Association*, Vol. 35, No.4 (March 1949), 607-26.

115 Millard Fillmore, First Annual Address to Congress, 2 December 1850, The American Presidency Project, <http://www.presidency.ucsb.edu/ws/?pid=29491>, accessed November 2014 ; Robert Scary, *Millard Fillmore* (New York: McFarland, 2001), 229.

116 Mansfield, *History of the Great Lakes*, 660-61; also see J.E. Hopkins, *1850: Death on Lake Erie: The Saga of the S.P. Griffith* (Frederick, Maryland: American Star Books, 2011); "Marine Disasters and Losses of Life and Property," *Report of the Fourth Annual Meeting of the Board of Lake Underwriters Held at Buffalo, February 10th, 1858* (Buffalo: Clapp, Matthews & Company, 1858), 8.



Lloyd's Steamboat Directory and Disasters on the Western Waters..., 17 Jun 1850, p. 261-65

Figure 13. The wreck of the steamer Griffith, 1850.

As the 1851 shipping season ended, Fillmore again addressed Congress on the issue of Great Lakes navigation. He reminded them that, “great numbers of lives and vast amounts of property are annually lost for want of safe and convenient harbors on the Lakes. None but those who have been exposed to that dangerous navigation can fully appreciate the importance of this subject.” Inaction not only increased the number of lives at risk but lack of maintenance meant that works already constructed were being lost. “The whole Northwest appeals to you for relief, and I trust their appeal will receive due consideration at your hands.” He also reminded catchpenny legislators that for a rare moment in United States history the federal government was running a revenue surplus.¹¹⁷

Fillmore’s second appeal was reinforced by an important and unexpected decision by the United States Supreme Court. In the case of *Genesee Chief v. Fitzhugh*, the court established that federal jurisdiction extended not simply to coastal waters as James K. Polk had argued, but to all waters where interstate and international commerce take place. The case was based on an 1846 collision on Lake Ontario between the propeller steamer *Genesee Chief* and a grain schooner *Cuba*. The latter vessel was bound from Lake Erie with a cargo of grain when she encountered heavy seas. She took in most of her canvas and was running with the wind. The steamer being a powered vessel had much

70 ¹¹⁷ Millard Fillmore, Second Annual Message to Congress, 2 December 1851, The American Presidency Project, <http://www.presidency.ucsb.edu/ws/?pid=29492>, accessed November 2014.

more control over her movements, but the master did not maintain a proper lookout and collided with the *Cuba* and sent her to the bottom. The Federal District Court heard the case in accordance with a law passed by Congress in 1845 that extended United States Admiralty law to inland waters. There had been much doubt about the Constitutionality of the law, and many Democrats assumed it could not survive review by the high court. Yet when the owners of the *Genesee Chief* challenged federal jurisdiction, Chief Justice Roger B. Taney overturned previous precedence and upheld the law. In doing so he left no doubt that the Great Lakes were as much a legitimate sphere for federal responsibility as the Atlantic Coast. “These lakes are in truth inland seas,” he wrote for the majority. “Different States border on them on one side, and a foreign nation on the other. A great and growing commerce is carried on upon them between different states and a foreign nation, which is subject to all the incidents and hazards that attend commerce on the ocean. Hostile fleets have encountered on them, prizes have been made and every reason which existed for the grant of admiralty jurisdiction to the general government on the Atlantic seas, applies with equal force to the lakes.”¹¹⁸

Empowered by the Supreme Court and entreated by the President, Congress finally acted on navigational improvements in 1852. No longer entangled with the legacy of the Mexican War, the House of Representatives responded with a massive appropriations bill. The legislation was a pragmatic alliance of Democrats from the Lake States with northern Whigs. The River and Harbor Bill of 1852 was bigger than any that came before. It called for more than \$2 million to be devoted to the Great Lakes and inland rivers.

The bill did not, however, enjoy smooth sailing in the Senate. Stephen Douglas of Illinois tried to restore the old political alliance between the West and the South by offering an amendment. His plan called for internal improvements to be paid for not by Congressional appropriation but by local levies on shipping. This was an old and long discredited idea which was a favorite of strict constructionists. It was also a provision that was contrary to the 1787 Northwest Ordinance, which forbade restriction on the use of inland waterways. Douglas floated this unseaworthy idea out of ambition for the presidency, which might come his way at the Party convention in 1852—if he could win the support of Southern colleagues in Congress. South Carolina’s Andrew Butler, who was given to emotional outbursts, claimed the House River and Harbor Bill was so sectionally biased it was the equivalent to “burning the cotton of the South,” and he threatened to filibuster if Douglas’s amendment was not accepted. Jefferson Davis was only slightly more measured when he said the massive River and Harbor Bill threatened the nation with “dissolution.” Henry Clay, the Whig leader on internal improvements, responded with a warning. How long would it be, he argued, “before the people would rise up on mass and trample down your little hairsplitting distinctions about what is national and state and demand what is fair and just.” In spite of Douglas’s attempt at political log rolling and the overheated outburst of Southern Senators, the House bill was accepted by the majority of the Senate, and it was signed into

118 United States Supreme Court, *The Propeller Genesee Chief v. Fitzhugh*, 53 U.S. 443 (1851), <http://caselaw.lp.findlaw.com/scripts/getcase.pl?court=US&vol=53&invol=443>, accessed December 2014.

law by President Fillmore in August.¹¹⁹

In the ever-escalating battle between the North and the South, the issue of internal improvements was second only to slavery in deepening the political divide. It would be a mistake, however, to down play the importance of navigational improvements in creating the momentum that led to the eventual formation of a purely sectional party. Isaac Stephenson, a sailor, vessel owner, and eventually a lumberman, was disgusted by the Democratic Party's anti-federalism. "The idea that the lakes were little more than a 'goose pond' prevailed in Congress" with the result every sailor on the lakes became a Whig and afterwards a Republican." Such sentiments were cemented when in 1854 Democratic President Franklin Pierce vetoed a \$2.5 million river and harbor bill. Although Congress later overrode his vetoes of two smaller bills improving Great Lakes navigation, Pierce was clearly a foe of the lake marine. He and his successor in the White House, James Buchanan, were both Northern men, but they understood that the unity of the Democratic Party depended on acceding to the South's strict interpretation of the Constitution. When the Whig Party disintegrated following the 1852 election, the issue of inland seas improvements became a cornerstone of the new Republican Party—an organization founded in 1854 in the Great Lakes states. Historian Marc Egnal, in his 2011 book *Clash of Extremes: The Economic Origins of the American Civil War*, argues that economic issues, such as navigation, played a determining role in the creation of the Republican Party. Slavery in his opinion may have sparked the Civil War, but the gulf between the regions emerged in the decades of fighting over economic interests.¹²⁰

The "Survey of the Northern and Northwestern Lakes"

In the winter of 1838-39 Army engineer William G. Williams put the finishing touches on an extensive survey he had made on the waters around Buffalo, New York. He saw this survey as a useful extension of his work on harbor improvements at the mouth of the Buffalo River. The town that had only a few hundred residents when it received its first lighthouse in 1819 had grown close to 16,000 people. Many more thousands passed through every year when they transferred from canal boats to lake steamers on their migration west. A chart indicating the depth of the channels and fully articulating the shore would add to the safety of vessels entering and leaving Buffalo's port. Great Lakes ship owners and merchants had lobbied for accurate charts of the inland seas for decades. Captain Williams's Buffalo chart was the beginning of a long process by which scientific methods would win from the wilderness waters the true shape, depth, and size of the Great Lakes.

The United States first turned its attention to charting its shorelines in 1807 when Thomas Jefferson signed legislation authorizing the production of nautical charts of the Atlantic Coast. As commerce on the Great Lakes skyrocketed in the wake of the 1826 opening of the Erie Canal, petitions made

¹¹⁹ Paskoff, *Troubled Waters*, 85-101; Victor L. Albjerg, *Internal Improvements without a Policy (1789-1861)* *Indiana Magazine of History*, Vol. 28, Issue 3 (1932): 168-79.

¹²⁰ Isaac Stephenson, *Recollections of a Long Life*, 92-94; Yonatan Eyal, "Franklin Pierce, Democratic Partisan," *A Companion to Antebellum Presidents, 1837-1861*, Joel L. Silbey, ed., (New York: Blackwells, 2014), 360; Larson, *History of Great Lakes Navigation*, 15-16 ; Egnal, *Clash of Extremes*, 205-26.

their way to Congress to extend chart-making to the lakes. An October 1831 petition complained that there were now so many vessels on the lakes that it was no longer possible “that knowledge of the Lake dangers should be in the minds of a few able navigators, and by them handed down, with more or less uncertainty, to their successors.” What the lake marine needed were charts locating the dangerous shoals, accurately depicting the size of channels, the location of lighthouses and harbors. The Royal Navy, largely through the efforts of Henry W. Bayfield created a series of charts of the Great Lakes shoreline, but these were not generally available to sailors on the United States side of the lake and Bayfield’s charts were based on very limited depth soundings. In 1841 Congress responded to this need by making a \$15,000 appropriation for the Army Corps of Topographical Engineers to inaugurate “a hydrographic survey of the....northern and northwestern lakes of the United States.” It was the beginning of a long process that would extend into the second half of the twentieth century.¹²¹

The task was extremely daunting and the paltry appropriation made by Congress to begin the process reflected the legislator’s lack of appreciation for the size and complexity of the Great Lakes waterway. Even a glance at the imperfect maps of the region that were available in the capital would have revealed over 3,000 miles of shoreline stretching from east to west. Charting these waters, of course, meant properly mapping every bay, inlet, peninsula, and shoreline meander. This would entail 4,700 miles of lakefront. Because the lakes narrowed at key points on Lakes Ontario, Erie, Huron, and Superior, and especially the Detroit River and Lake St. Clair, it was also necessary to map a corresponding portion of the shoreline of British North America. This would require that better than 6,000 miles of Great Lakes waterways be mapped and charted.¹²²

Many of the engineers who helped to begin the survey had earlier worked on harbor improvements, and although those projects were slowed by political infighting in the 1840s and 1850s the work of charting was carried on. There were two phases to the field work of the U.S. Lake Survey. The survey party undertook topographic mapping and the shore party made hydrographic measurements. The survey party faced a daunting task. They had to establish baselines from which a series of triangles could then be projected. The advantage of this method was pinpoint accuracy and the fact that many lines did not have to be actually traced out but could be calculated based on the coordinates of previously fixed points. The hard part was establishing the baselines in the heavily forested Great Lakes region. Work started on Mackinac Island and in laying out a baseline at the head of Green Bay. The Green Bay site was chosen for the baseline because its complex web of islands and channels were a challenge to navigation. The peninsulas and islands of the region also created a means to lay out a series of triangles from the western shore of Lake Michigan to the eastern shore. Army engineers were also cognizant of the relationship of what they were doing to national defense. The area between

121 Arthur M. Woodford, *Charting the Inland Seas: A History of the U.S. Lake Survey* (Detroit: Wayne State University Press, 1994), 10-14; Christopher Baruth, “Mapping the Great Lakes, 1670-2007,” Wisconsin Water Library, University of Wisconsin Sea Grant Project, <http://greatlakesmaps.org/Default.aspx?tabid=89>, accessed November 2014.

122 Comstock, C.B. Comstock, *Report Upon the Primary Triangulation of the United States Lake Survey, United States Army Corps of Engineers*, (Washington D.C., United States Government Printing Office, 1882), 2.

Mackinac Island and Green Bay would inevitably become a seat of war if conflict between Great Britain and the United States was resumed.¹²³

The survey party tried to make use of hills and promontories from which to take measurements, but along the heavily timbered, topographically flat shoreline typical of Lake Michigan, they were forced to build wooded towers. To get over the towering white pine trees sometimes these towers had to be 120 feet in height. They also had to be very stable so that transits could be brought to a platform at the top and used to determine the coordinates of another station ten to twenty-five miles away. John H. Foster worked as a surveyor in 1844 establishing a baseline at the northern tip of Lower Michigan. His day began at 4 A.M. with a breakfast of hardtack and fried pork washed down with coffee. The men then left camp for where they had finished clearing the ground for the baseline, “The mosquitoes and black flies fairly swarmed in that close, hot, forest-lined avenue, termed the base line, base in more senses than one. Without the protection of shields over the face, buckskin gloves, and top boots, it would have been impossible to work in such a place.” They chopped down trees and cleared brush along the baseline, and other than a lunch break, they worked as long as light allowed, which in the summer months meant a fifteen hour day. Arriving back at camp the men supped on the same monotonous fare as breakfast before retiring to their white canvas tents and sleep—all save one. The chief engineer had to sit down and then transfer from his field notebook all the measurements recorded during the day. Foster described using a barrel head as a writing desk and many times he would find himself stiffly sitting with the makeshift desk in his lap when he awoke to the morning call “turn out.” In later years, he thought of these long hard days whenever he heard people scoff at loafing government workers. To hack out a baseline and build the transit tower required a large crew of experienced woodsmen. French-Canadians and American Indians, often as many as sixty in number did the axe work and manned the oars when it was necessary to move the camp. The experienced boatmen were particularly helpful when the surveyors measured the depth of the inshore waters.¹²⁴

While work at the head of Lake Michigan went on, other topographical engineers had begun surveys of Lake Erie’s busy harbors. To survey the difficult waters around the Lake Erie Islands the engineers laid out a baseline on South Bass Island from which triangulation could capture the rest of the archipelago. In 1852 charts of this section of the waterway were released. Any vessel master who presented a certificate from a customs collector could receive this chart free of charge. This was also true of charts issued in subsequent years. In the 1850s the survey proceeded to chart the approach to the St. Mary’s River, Saginaw Bay on Lake Huron, and their work on northern Lake Michigan was extended into the busy Manitou Passage.¹²⁵

The early years of the Lake Survey were beset by the same ante-bellum penny-pinching policies that hurt all aspects of federal administration from national defense to lighthouse administration. The

¹²³ Woodford, *Charting the Inland Seas*, 20-21.

¹²⁴ John H. Foster, “Reminiscences of the Survey of the Northwestern Lakes,” *Michigan Pioneer and Historical Collections*, Vol. IX (1886): 100-5.

74 ¹²⁵ Woodford, *Charting the Inland Seas*, 31-41.

topographical engineers had few and inferior technical tools to work with. Their budgets were small and doled out in small annual appropriations that inhibited comprehensive planning. Just as the survey began to build some momentum in 1846, the Mexican War hit staffing and funding. Nonetheless, the Lake Survey's engineers and crews developed an intimate knowledge of the topography and hydrology of the areas in which they worked. They promoted safer navigation not simply by preparing charts of the inland seas. When they came across exposed reefs, they erected wooded tripods so that the danger could be more readily identified from the deck of an approaching ship. Wherever their measurements of water depth revealed dangerous shoals, they attempted to place buoys. Working one season in the Mackinac Straits area the engineers made more than 9,700 separate depth soundings, placed wooden tripods on two exposed reefs and placed eighty-two marker buoys. In this way, the hardworking engineers made an immediate impact on the safety of Great Lakes navigation. Engineer W.H. Harding recalled that "during the year 1859 more than 5,000 charts were issued [by the Lake Survey] office in Detroit and there is scarce a vessel of any consideration on the lakes which has not a full set of them on board."¹²⁶

Communication between the army officers working on the Lake Survey and mariners worked to improve safe shipping on the inland seas. In 1854 a schooner belonging to George Tiff, one of Buffalo's most important capitalists, was caught in a Lake Michigan gale. The vessel's rudder was carried off and only an improvised mechanism and skilled seamanship allowed the captain to guide his vessel into a narrow channel that broke the sandy shoreline. To their relief, they found more than four feet of water in the Betsie River and followed it to a small lake where they were sheltered from the gale. Tiff operated a fleet of sailing ships called the "Troy and Michigan Six-Day Line." He knew the importance of harbor of refuge along the broad undeveloped shore of Lake Michigan, and immediately bought up the land around the small sheltered lake. He then used his influence to have Congress pass a special resolution to fund a survey of the Betsie River and Lake. In 1859 Captain George G. Meade ordered Lieutenant Orlando Poe to sound the depth of the water in the vicinity and to assess its potential as a harbor. Poe reported favorably on the site but recommended dredging to make the Betsie River navigable during all seasons. Rather than wait vainly for Congress to make an appropriation, lumbermen who were building a sawmill on Lake Betsie's shore undertook the work themselves. The survey and the dredging led to the founding of the city of Frankfurt, Michigan.¹²⁷

By the 1870s the mapping of the Canadian side of the lakes had fallen behind the high standard set by United States Army engineers. Officials in British North America relied on the marvelous charts made by the Royal Navy's Henry W. Bayfield between 1817 and 1825. Bayfield had been both diligent and careful. He spent four years on Lake Huron and Georgian Bay where he reported "we

¹²⁶ *The Life and Letters of George Gordon Meade* 208-10; Henry E. Borger, *The Role of Army Engineers in the Westward Movement in the Lake Huron-Michigan Basin Before the Civil War*, (Ph.D. Dissertation, Columbia University, 1954), 180-84; W.H. Harding, Address to the Houghton County Historical Society, n.d., Harding Journal and Papers, Bentley Historical Library, University of Michigan, Ann Arbor.

¹²⁷ George Gordon Meade to Orlando Poe, 24 March 1859, *Michigan in Letters*, edited by John Fierst and Susan Powers, Clarke Historical Library, <http://www.michiganinletters.org/2010/05/orlando-poe-and-united-states-lake.html>, accessed February, 2015.

have ascertained the Shape, size & situation of upwards of 6,000 islands, flats and Rocks.” But Bayfield operated under the most primitive of circumstances and tailored his charts to the navigation needs of the day in which most vessels were shallow draft sailing ships and Georgian Bay was remote from the main lines of commerce. This changed in the 1870s and 1880s when ship size grew and Bayfield’s charts were inadequate to the needs of navigation. Requests for new charts were ignored until tragedy struck in September 1882. The steamer *Asia* was one of a fleet of vessels that carried passengers between two sections of the Canadian Pacific Railroad—from Georgian Bay to the western end of Lake Superior. One hundred and twenty-three people died when the *Asia* foundered, only two hardy survivors lived to tell the tale. Poor charts were not the direct blame for the disaster, but it awoke Canadian officials to the need for greater vigilance. In 1883 the Royal Navy answered the Dominion of Canada’s request for a new survey of Georgian Bay, which eventually led to a resurvey of all their Great Lakes waters.¹²⁸

Lighthouses in the Era of Bad Feelings

Lighthouses, like harbors and accurate charts were part of the web of navigation aids that were desperately sought in the antebellum Great Lakes region. Unlike harbors, lighthouses were not opposed in principle by strict Constitutional constructionists or sectional partisans. The early embrace of lighthouses by the “founding fathers” in the first Congress under the Constitution and in the administrations of Washington, Adams, Jefferson, and Madison went far to inoculate these types of navigational aids from partisan wrangles. For example, in 1847 while the issue of harbor and channel improvements was sparking sectional tensions between the West and the South, Congress approved a massive expansion of the lighthouse system including seventeen lighthouses or beacons on the Great Lakes.¹²⁹

While lighthouses and related navigational aids were not challenged in principle, as the system grew, it began to occupy a larger and larger role in federal appropriations. In 1822 there were seventy lighthouses in the United States. By 1842 this number had grown to 256 lighthouses and thirty light ships. The Great Lakes were included in this growth with thirty-four new lighthouse constructed in the 1830s, but only twenty new lights in the 1840s. Individual lighthouse keepers received little in the way of supervision or assistance. Each spring Stephen Pleasonton, the Treasury auditor who oversaw the lighthouse system, chartered a vessel for a general inspector of lights to visit the upper lakes. This ship would then deliver to each lighthouse its annual supply of oil. Accompanying the inspector was a lamp-maker who could make any necessary repairs to the apparatus. After this brief visitation, the light keepers were generally left to their own devices for the rest of the season. The set orders for keepers only specified when their lights were to be lit at the start of a season, when they could be extinguished, and that the reflectors should be kept clean and the lamps trimmed. When Pleasonton

128 Hugh Whiteley, “Henry Bayfield, 1795-1885,” *Contributions to Professional Engineering*, <http://www.engineeringhistory.on.ca/index.php?id=3>, Accessed February 2015; William Ratigan, *Great Lakes Shipwrecks & Survivals* (Grand Rapids: William B. Eerdmans, 1960), 106-9.

129 Lighthouse Board, *Laws of the United States Relating to Establishment, Support, And Management of Light-Houses, Light Vessels, Monuments, Beacons, Spindles, Buoys, And Public Piers of the United States From August 7, 1789 to March 3, 1855*, (Washington, DC: A.O.P. Nicholson, Public Printer, 1855), 128-33.

required information on a lighthouse or navigation issue he relied upon the Treasury Department's collectors of customs. Unfortunately, individual customs officials were often hundreds of miles away from a lighthouse or an area in question. Great Lakes collectors only made occasional inspections of lighthouses in their district.¹³⁰

As the system grew and complaints about the quality of lights increased, it was inevitable that Congress would begin to scrutinize calls for new lighthouses and the administration of existing beacons. In March of 1837 Congress approved a bill authorizing the construction of a large number of new lighthouses from Maine to the mouth of the Mississippi including new structures on lakes Erie, Huron, and Michigan. Some of these new lighthouses, such as ones at Manitowoc and Racine in the Wisconsin Territory and at the mouth of the Kalamazoo River and the Grand River in Michigan, were at sites where Congress had not made any provisions for constructing a harbor. With one hand, the government recognized these locations as places of marine activity and with the other dismissed their need for navigational improvements. Perhaps it was this anomaly that prompted legislators to add a provision to their authorization bill. A Board of Navy Commissioners was created to examine each proposed project to determine if at some sites "navigation is so inconsiderable as not to justify the proposed works." Twenty-two naval officers were assigned to the inspections and their recommendations revealed something was amiss in the way lighthouse decisions were being made. The Navy determined that thirty-one of the proposed lighthouses were not needed.¹³¹

The Board of Naval Commissioners was not continued beyond the 1837 Lighthouse Act, but it was an indication that Congress was beginning to pay closer attention to the nation's growing lighthouse establishment. In 1837 Edmund March Blunt, author of the most widely used mariner's guide to the American Coast, complained to the Secretary of the Treasury that "the whole lighthouse system needs revision, a strict superintendence and an entirely different plan of operation." The House Committee on Commerce, after reviewing the report from the Naval Commissioners, concluded that Blunt was right. The committee admitted that in the past Congress had simply responded to the requests of petitioners for a lighthouse without investigating how legitimate the need for a beacon. To address this issue Congress ordered in 1838 the creation of regional lighthouse districts. Each of these districts was then assigned a naval officer to inspect all navigational aids therein. The inspectors were also expected to make reports regarding the condition of each and make recommendations for any future lighthouses.¹³²

The Great Lakes were divided into two districts. Lieutenant James T. Homans was given the task of inspecting the lakes west of Detroit. During the course of the summer, he covered 1,825 miles.

130 Stephen Pleasonton to Thomas Corwin, Secretary of the Treasury, 14 December 1850 in, United States. Bureau of Light-Houses, *Compilation of Public Documents and Extracts from Reports and Papers Relating to Light-Houses, Light-Vessels, and Illuminating Apparatus, 1789-1871* (Washington, D.C.: Light-House Establishment, 1871), 542.

131 George R. Putnam, *Lighthouses and Lightships of the United States* (Boston: Houghton-Mifflin, 1917), 42; George Weiss, *The Lighthouse Service, Its History, Activities, and Organization* (Baltimore: Johns Hopkins University Press, 1926), 7.

132 Arnold Burges Johnson, *The Modern Lighthouse Service* (Washington, DC: Government Printing Press, 1890), 15-17.

He was not pleased with most of what he found. At the shallow and difficult to navigate St. Clair Flats, he found a channel marked by a “public spirited ship captain” when it clearly should have had government buoys showing the way in day and night. He sited a new lighthouse at the entrance to Saginaw Bay. At the northern end of Lake Huron, he found the tower at Bois Blanc Island collapsed and had to locate a new spot for reconstruction. He noted that the Straits of Mackinac where Lakes Michigan and Huron came together were not properly covered. A lightship assigned to duty there in 1836 was almost never on station. The vessel had been repeatedly driven from its moorings, storm-battered, and beached. Mackinac lacked the ability to dry dock the vessel and properly patch her so each time she was beached, the lightship had to be sent to Detroit for repairs. Homans recommended the lightship be sent to the more protected waters of Lake St. Clair, and a new more durable vessel or a permanent lighthouse be assigned to the dangerous Waugoshance Shoal that stuck like a bone in the throat of the strait’s western entrance. He also recommended that a new lighthouse be placed at Mackinac Island. At South Manitou Island Homans recognized Crescent Bay as one of the best natural anchorages on the Great Lakes, and he selected an advantageous site for a lighthouse. He arrived at Grand River when the new lighthouse there was being constructed. He found the materials and methods decidedly flawed. This disturbing finding and his other recommendations were reported to Stephen Pleasonton, the Treasury Department auditor who supervised the U.S. lighthouse system. The auditor’s response was less than energetic. He claimed Homans’s critique of the Grand River work was unfounded. The overmatched lightship at the Straits remained in duty until 1844, and the recommended lighthouse at Mackinac was put off even longer.¹³³

The naval officers pulled no punches in their report. They were tied to neither the Treasury Department that administered lighthouses nor the Army whose engineers developed harbors. They looked at Great Lakes navigation and navigational aids with the eye of experienced seamen. They unhesitatingly stated that “the formation of harbors at convenient distances along the entire lake shore is a matter of the first importance” and it was the only way to secure lives and property in the region. They also were critical of the way harbor improvements and lighthouse construction had been carried out. When Congress determined to fund construction, it doled funds out in small annual increments that did not allow for effective planning or spending. Much money was wasted because incomplete works were destroyed by winter storms while they were waiting for funding for completion. Congress was generous in funding lighthouses, but again wasted money because the lights were not part of comprehensive harbor plans. Congress would site a lighthouse with no regard for how harbor improvements might change navigation requirements. For example, most Great Lakes harbors required piers to be built at the mouth of rivers to block the formation of sand bars. Those piers jutting out into the lake needed pier head lights while light towers built farther inland might be

¹³³ Holland, *American Lighthouses*, 29; T. Michael O’Brien, *Guardians of the Eighth Sea: A History of the U.S. Coast Guard on the Great Lakes* (Honolulu: University Press of the Pacific, 2001), 15-16 ; Letter from the Secretary of the Treasury, Transmitting A Report of the Fifth Auditor, in relation to the execution of the act of 7th July last, for Building Light-houses, Light-boats, etc. H. Doc. 19, 19th Cong., 1st sess., 1838, Serial 131.

no longer needed. They went so far as to say that “nearly all light-house appropriations would have been much more advantageously employed in constructing harbors.” Perhaps most alarming of all, the naval officers found many lighthouses in the Western Great Lakes often ran short of oil with which to light their lamps and they had no way of securing additional oil.¹³⁴

Pleasanton’s balky response to Lieutenant Homans’s report both in terms of its general suggestions and its specific mention of problems at the Grand River light was typical of his administration and Congress’ weak oversight. Navy inspectors determined that 40 percent of American lighthouses had serious defects, yet Congress took no formal action to improve the management of the system. Fortunately, Pleasanton’s administration of U.S. lighthouses was again brought under direct scrutiny in 1842 when Congress authorized the House Commerce Committee to determine if the Lighthouse Establishment should be completely reorganized. The auditor’s relationship with Winslow Lewis and the numerous times his lighthouses had to be rebuilt was finally broached in an open hearing. Yet Pleasanton managed to deflect these attacks as well as complaints from mariners that U.S. lighthouses were totally inferior to those operating in Europe. The committee seems to have been more concerned with seeing if expenses could be reduced. Penny-pinching was the one thing that Pleasanton did well so it was no surprise the committee endorsed his administration. Fortunately, complaints from the marine establishment did not cease, and in 1843 Congress acted to provide more professional management for lighthouse construction. It specifically ordered that an army engineer be detailed to oversee the building of a Lake Michigan lighthouse. In the years that followed this became increasingly common.¹³⁵

Comprehensive reform finally came in 1851. As part of its normal lighthouse appropriation bill Congress ordered the formation of a board to undertake a complete review of the management of American lighthouses “and to make a general detailed report and programme [sic] to guide legislation in extending and improving our present system of construction, illumination, inspection, and superintendence.” The bill specified that the composition of the board include two high ranking naval officers, two army engineers, and a civilian of “high scientific attainment.” Under the direction of Commodore William B. Shubrick, this board undertook a wide-ranging investigation, visited many lighthouses, interviewed mariners, and examined the new technology that was being deployed by other nations. Their 760-page report was the final torpedo into Stephen Pleasanton’s leaky administration of U.S. navigational aids. In every aspect of the program, they found problems. Pleasanton’s lighthouses were poorly lit, had inferior lenses, were constructed too low and of inferior materials, buoys were too small, lightships were all but useless due to poor illumination, light keepers were without instruction and in need of assistants, many lighthouses were in desperate need of repair, even colonial era lighthouses

¹³⁴Lt. G.J. Pendergrast, “Recapitulatory Report, Erie, Pennsylvania, August 18, 1837,” United States. Bureau of Light-Houses, *Compilation of Public Documents and Extracts from Reports and Papers Relating to Light-Houses, Light-Vessels, and Illuminating Apparatus, and to Beacons, Buoys, and Fog Signals, 1798-1871* (Washington, D.C.: U.S. Lighthouse Establishment, 1871), 90-91.

¹³⁵Weiss, *The Lighthouse Service*, 9-1; Putnam, *Lighthouses and Lightships of the United States*, 43; Stephen Pleasanton to John P. Kennedy, Chairman, Committee of Commerce, 13 May 1842, *Compilation of Public Documents and Extracts from Reports and Papers Relating to Light-Houses*, 311-16.

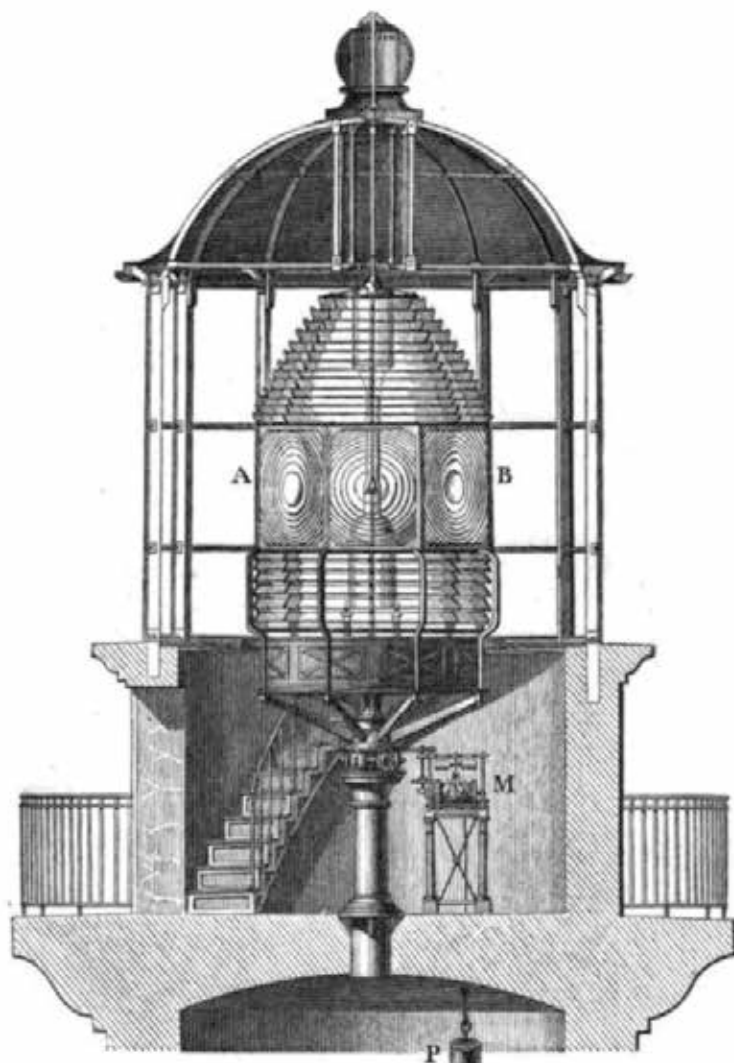


Figure 14. Cut-away of a lantern room with a Fresnel Lens.

were in better shape than those constructed since 1789 . A final damning shot at Pleasonton was the contention that with competent professional management, the United States would operate with greater effectiveness and less expense. Congress wasted no time implementing the report. In October 1852 all administrative duties for lighthouses were transferred from Pleasonton to the Lighthouse Board, which became a permanent administrative body. The lighthouse service would remain in the Treasury Department with its Secretary acting as ex officio President of the Board, but all management would be in the hands of the board. Twelve local administrative districts were created with the Eleventh and Twelfth in the Great Lakes. Each district would have a full-time inspector appointed by the president. This new, much-

improved management system would remain in place until 1910.¹³⁶

As important as the administrative change to Great Lakes lighthouses was, the technical change ordered by Congress as part of the March 3, 1851, Act. Without even waiting for the recommendations of the Lighthouse Board, the Congress authorized the adoption of the Fresnel lens for all U.S. stations. This was a change long overdue and needlessly delayed by Stephen Pleasonton because of his misguided loyalty and questionable association with Winslow Lewis. While American lighthouses were outfitted with Lewis's flawed parabolic reflectors, every advanced maritime nation had adopted the Fresnel lens. Invented in 1822 by the French scientist Augustin Fresnel, the new lens was a series of concentric

¹³⁶ An Act making appropriations for lighthouses, lightships, buoys, &c., and providing for the erection and establishment of the same, and for other purposes, March 3, 1851, in *Laws of the United States Relating to the Establishment, Support, and Management of Lighthouses*, 155-59 ; *Report of the Officers Constituting The Light House Board Convened Under Instructions from the Secretary of the Treasury to Inquire Into the Condition of the Light-House Service of the United States, Under the Act of March 3, 1851*, 32nd Congress, 1st Session, Senate Executive Document 28 (Washington, DC: A. Boyd Hamilton, 1852), 7-10; Holland, *American Lighthouses*, 36.

rings of glass prisms looking rather like a bee hive. The effect was to bend the light into a powerful, narrow beam that could be seen from between twenty and forty miles away.

Fresnel Lenses were produced in a variety of sizes or “orders.” The largest size was the giant first-order lenses that stood twelve-feet high and six-feet in diameter. These lenses were designed for coastal navigation and could project their beam far out into the ocean to notify vessels they were approaching a continental coast. In contrast, a sixth-order light was only a foot wide but did the job of marking the entrance to a harbor. There were no first-order lights deployed on the Great Lakes; the enclosed nature of the waterway made their size and range unnecessary. All Fresnel Lenses were expensive and the first-order especially so. These giant lights were also difficult to deploy in existing older light towers because of their size and especially their weight, which was between five and six tons. Only five of the next largest, second-order Fresnel lenses were deployed on the Great Lakes. The first was at Grosse Point just north of Chicago. These six-foot high lights were only deployed at stations designed to be, in the Lighthouse Board’s words, “the largest and most important lighthouse in the district.” The vast majority of lenses deployed on the inland seas were third-order and fourth-order lights, with even smaller ones set on pier heads.¹³⁷

On the Canadian side of the lakes, lighthouse construction was the charge of the colony of Canada West (Ontario) and its Board of Works. While not as irresponsible as the Pleasonton administration in the states, the board was just as frugal. Navigational aids were funded but largely on the well-travelled waters of lakes Ontario and Erie. In general the lack of transportation slowed the development of the colony. Canada West did not receive its first railroad until 1853. Two years later, track was extended to Collingwood on Georgian Bay. The effect of this connection was to spur the rapid settlement of the area, and Collingwood became one of the busiest Canadian lake ports due to dense stands of merchantable timber and its proximity to the growing U.S. ports like Chicago and Milwaukee. The opening of the Sault Ste. Marie Canal and the signing of a free-trade agreement between the United States and the Canadian colonies in 1854 further increased lake traffic on Georgian Bay and Lake Huron. In spite of this, there were no navigational aids on Georgian Bay. In 1853 the steamer *Kalooah* ran aground at almost the exact same spot where another steamer had been lost the year before. Schooners frequently grounded on shoals that had earlier been charted by the Royal Navy but which were not marked by any navigational aid. An ambitious plan was soon proposed to erect eleven state-of-the-art lighthouses along Georgian Bay. John Brown, a successful masonry contractor, was given the commission. Unfortunately, the task of building the towers at remote locations exceeded colonial appropriations and Brown nearly went bankrupt trying to complete six of the eleven. However, those six were stout, strong and tall (five of the six were eighty feet), and outfitted with a Fresnel lens. Known as the “Imperial Towers” they remain some of the

137 Terry Pepper, “The Incredible Fresnel Lens: A Brief History and Technical Explanation,” *Seeing the Light Lighthouses of the Western Great Lakes Webpage*. <http://www.terrypepper.com/lights/closeups/illumination/fresnel/fresnel.htm>, accessed, November 2014; Donald J. Terras, Grosse Point Light Station National Historic Landmark Nomination, March 1998, 13.

most picturesque lights on the entire Great Lakes.¹³⁸

The establishment of the Lighthouse Board brought professionalism to the management of U.S. Great Lakes lighthouses. Between 1854 and 1857 scores of new lighthouses were built, and the rest were enhanced with the new more efficient Fresnel lenses. An even bigger job was the rebuilding of the many lighthouses that, under Pleasonton, had been built too short or were of inferior materials. Between 1857 and 1859 the Board rebuilt or refitted forty-five Great Lakes Lighthouses. The new towers and their beacons piercing a murky midnight were a powerful signal to both mariners out upon the somber seas as well as to the farmers and merchants who depended upon them that a change for the better was at hand. Scientific mapping and lighting reduced the dangers to inland seas navigation. Only the growing sectional and partisan divide that inhibited investment in clear channels and safe harbors continued to darken the dawn of a new day.¹³⁹



Library of Congress, LC cwpbh.011198

Figure 15. George Gordon Meade, photograph by Mathew Brady.

138 Claire Elizabeth Campbell, *Shaped by the West Wind: Nature and History in Georgian Bay* (Vancouver: University of British Columbia Press, 2005), 41; *Buffalo Daily Republic*, 13 July 1853; Wayne Sapulski, "The Imperial Towers of Lake Huron and Georgian Bay," *Lighthouse Digest* (December 1996), <http://www.lighthousedigest.com/digest/StoryPage.cfm?StoryKey=156>, accessed, October 2015.

139 Carol P. Miller and Charles K. Hyde, United States Coast Guard Lighthouse and Light Stations of the Great Lakes, National Register for Historic Places Nomination, Historic American Engineering Record Survey, 1979, Section 8, p.3.

CHAPTER 4

Lighting the Way Forward

1860–1880

The Crisis Comes

As the snow fluttered past his window in the Detroit office of the U.S. Lake Survey, Captain George Gordon Meade contemplated the future of his country, his service, and the daunting mapping project that was under his command. He had commanded the Lake Survey since 1856. During that time, he had done much to increase its scope and to improve the scientific footing of its operations. Meade began the first systematic collection of meteorological data in the Great Lakes region by setting up nineteen formal collection stations from northern Minnesota to the head of the St. Lawrence River. Although embryonic in the 1861, it was the basis for the future study of regional climate patterns and important for the eventual production of the first marine weather forecasts. He also began the systematic collection of data on Great Lakes water levels, of no small concern to the mariners. Meade dramatically improved the accuracy of the survey's longitudinal measurements through the ingenious use of the telegraph to make simultaneous readings of the meridian passage of stars at two separate points. To do this Meade collaborated with civilian scientists at Western Reserve College in Cleveland and at the University of Michigan. He also established an astronomical observatory in Detroit to improve the survey's calculation of longitude. Joseph Henry of the Smithsonian Institution and the Lighthouse Board regarded Meade as the nation's most gifted marine engineer and a budding man of science. Meade was an example of someone who would become of increasing importance in Great Lakes history. He was a skilled and dedicated professional attuned to the application of science to marine safety.¹⁴⁰

Meade came to his scientific approach to navigational improvements through long exposure to marine infrastructure engineering. Although he was a West Point graduate, Meade never had sought a military career, and he went to the academy because he was too poor for any other school. He stayed in the service only because it allowed him to support his family and develop his skill as an engineer. He had nonetheless distinguished himself in combat during the Mexican War, and after the Battle of Monterey he was brevetted to First Lieutenant. It was in lighthouse work, however, that he really distinguished himself. From 1851 to 1856 he worked on a wide variety of lighthouse projects from

¹⁴⁰ Comstock, C.B. Comstock, *Report Upon the Primary Triangulation of the United States Lake Survey*, United States Army Corps of Engineers, (Washington D.C., United States Government Printing Office, 1882), 8-12; George Meade, *The Life and Letters of George Gordon Meade* (New York: Charles Scribner's, 1913), 217.

the Delaware River to the Florida Keys. He pioneered the American application of new designs such as the screw-pile lighthouse that could be secured on soft alluvial soil. He also experimented with the use of iron in lighthouse foundations and superstructure. So keen was his interest in the technical workings of navigational beacons that in 1853 he designed a new type of lamp to be used with Fresnel lenses and that required less maintenance. Its operation was based on hydraulic pressure and was well suited to the Florida coast—although it was not used on the much colder northern lakes.¹⁴¹

While Captain Meade could look with satisfaction on the innovations and energy he brought to his five years of work on the Lake Survey, he was greatly distressed by the political drift of the nation whose uniform he wore. Like most Euro-Americans, Meade neither practiced nor supported the institution of slavery, but also like most of his countrymen he did not favor disturbing the national harmony with discussions of the morality of human bondage. He was disturbed equally by the evangelical fervor of anti-slavery activists and southern rights fire-eaters, who argued slavery was a necessary and positive social good. He was a man of science who distrusted emotion-driven politics and the application of moral sentiment over rational calculation. According to historian David R. Goldfield, ante-bellum American politics, particularly in the wake of the Compromise of 1850, were driven by evangelical Christianity's moral outrage over slavery and the opposite reaction it elicited from Southerners. In Goldfield's reading, the Republican Party, founded in 1854, was energized by evangelical political passion. Meade distrusted their over emphasis on slavery, but he had no appetite for the Democratic Party that seemed determined at all costs to placate the Southern slave interest. In the 1860 election, he cast his vote for John Bell, the candidate of the short-lived Constitutional Union Party that sought to defuse growing sectional tensions by the somewhat vague prescription of staying true to the Constitution.¹⁴²

Meade's son and biographer remembered that his father "depreciated all violent language, as subordinating reason to passion, as productive of no possible good, and certain to entail evil." This dispassionate approach to politics in the most passionate era of American civilization led some Detroit partisans to doubt the loyalty of the officers serving in the U.S. Lake Survey. At a mass meeting in 1861, resolutions were enthusiastically passed calling on the men of the survey to swear an oath of allegiance to the United States. This demand came at a time when a Confederacy of seceded states was being organized and many veteran serving officers had resigned their commissions and treasonously accepted high rank in the rebel military. Meade gathered his subordinates in his office. The majority found the demand they swear an additional oath offensive. Lieutenant J.L. Kirby Smith was especially aggrieved because his uncle, a regular army officer, had quit United States service and became a Confederate general. Meade and his officers responded by ignoring the patriotic mob and

141 George Meade, *The Life and Letters of George Gordon Meade* (New York: Charles Scribner's Sons, 1913), 206-9.

142 Meade, *Life and Letters of George Gordon Meade*, 212-13; David R. Goldfield, *America Aflame: How the Civil War Created a Nation* (New York: Bloomsbury Press, 2010), 1-15. Goldfield's thesis that evangelical religion caused an otherwise avoidable war has not been broadly embraced by historians; however, a recent book by James Oakes makes the case that the destruction of slavery was at the heart of the Republican Party agenda. Most historians would accept that evangelical Christianity provided the passion and power behind the anti-slavery movement. For more see, *Freedom National: The Destruction of Slavery in the United States, 1861-1865* (New York: W.W. Norton, 2012).

communicated to Washington, D.C., their willingness to stand by the government. In a matter of months, most of them were seeing active service in America's bloodiest war. Lieutenant Kirby Smith removed any question of his allegiance when he fell mortally wounded leading his regiment in the Battle of Corinth. Lieutenant Orlando Poe led troops in the Peninsula Campaign and later served as William T. Sherman's chief engineer during the March to the Sea. In 1863 George Gordon Meade, by then a Major General in command of the Army of the Potomac, turned back Robert E. Lee's Confederate tide on the field of Gettysburg. The former Lake Survey officers had more than proven their loyalty to the nation.¹⁴³

While it was the clash over slavery and its right to expand west with the United States that triggered the awful Civil War of 1861-1865, economic differences between the North, South, and the West were critical in helping to cut away the middle ground on which that issue might have been solved by compromise. Citizens of the Great Lakes states needed an activist federal government to further develop a transportation infrastructure that would integrate their towns and farms into the economic fabric of the nation. Since James Polk's veto triggered the 1847 River and Harbor Convention that marked the region's self-conscious political awakening, the trade of the lakes had continued to grow. Just between 1846 and 1851 the Port of Buffalo, New York, the destination of most lake shipments, increased arrivals by 54 percent. In 1852 they jumped another 24 percent. By the late 1850s the Great Lakes states had considerable political representation in the national government with fifty-one members in the House of Representatives from the region. Their frustration was that time and again their legislative victories were overturned by Democratic presidents upholding a strict interpretation of the Constitution. In 1859 Congress passed a bill that funded an improvement critical to every western state that was shipping produce on the Great Lakes. The so-called St. Clair Flats were a choke-point in inland seas shipping. Lake Huron is joined to Lake Erie by the St. Clair River, Lake St. Clair, and the Detroit River. These narrow and shallow waters were a challenge to all vessels but especially so for the more than 1,200 sailing ships trying to fight river currents. All types of vessels risked running aground on sand bars in Lake St. Clair or in the St. Clair River's marshy delta, known as the "flats." The 1859 bill would fund the dredging and marking of a safe deep water channel through the St. Clair Flats. Yet after the bill was passed James Buchanan deployed his presidential veto complaining that this waterway through which ships from eight states and several nations passed was a state not a federal responsibility. This type of obtuse executive action and the Southern Congressional support that upheld it pushed voters in the Great Lakes states away from the sole national political party, the Democrats, and in to the arms of the purely sectional Republican Party.¹⁴⁴

The rise of the Republican Party in the Great Lakes region was in the words of one historian "nearly

143 Meade, *Life and Letters of George Gordon Meade*, 215-16; John W. Fuller, "Our Kirby Smith," *Sketches of War History: Papers Read before the Ohio Commander of the Loyal Legion of the United States* (Cincinnati: Robert Clarke, 1888) 161-70.

144 Allan Pred, *Urban Growth and City Systems in the United States, 1840-1860* (Cambridge: Harvard University Press, 1980), 98-101; James L. Huston, *Calculating the Value of the Union: Slavery Property Rights and the Economic Origins of the Civil War* (Chapel Hill: University of North Carolina Press, 2003), 273-76; John Bassett Moore, editor, *The Works of James Buchanan, Comprising His Speeches, State Papers, and Private Correspondence, 1856-1860*, Vol. X, (Philadelphia: Lippincott Company, 1911), 385.

instantaneous and overwhelming.” The Kansas-Nebraska Act of 1854, which erased the Missouri Compromise line restricting slavery in the West, triggered the party’s birth. The actual birth place of the party—either Ripon, Wisconsin, or Jackson, Michigan—has been hotly debated, but historians are very clear that the Midwest’s anti-slavery stance was driven more by economics than moral outrage. The bitter racism of the Black Laws that denied basic civil rights to African-Americans in Iowa, Illinois, Indiana and Ohio were popular legislative actions. Restricting slavery reflected a regional determination to avoid economic competition with the potential of black labor in the West and the reality of Southern political clout in Washington. The Republicans espoused an economic agenda that was in harmony with the “culture of progress” that had been planted in the region since the opening of the Erie Canal. At its core was the notion that government had the job of removing obstacles to collective economic progress.¹⁴⁵

Some of the strongest sectional appeals made by the Republican Party in their 1860 platform had nothing to do with the issue of slavery. The platform appealed to farmers interested in expanding their acreage or moving to new territories in the West by the promise of a free homestead policy. A bill to authorize this had passed in the last Congress with only a single vote from a slave state representative only to be blocked by a President Buchanan veto. The platform promised federal support for building a railroad to the Pacific Coast. This measure had also been the subject of a bill in the recent Congress, but it failed to pass largely because it received not a single vote from a slave state representative. The most obvious sectional appeal was a platform plank that called for navigational improvements on the grounds of marine safety; “That the appropriation by Congress for river and harbor improvements of a National character, required for the accommodation and security of an existing commerce, are authorized by the constitution and justified by the obligation of Government to protect the lives and property of its citizens.” Abraham Lincoln, the party’s nominee for president, would no longer block Congressional support for the Great Lakes navigation with the threat of a veto. Lincoln had defended the Constitutionality of such appropriations at the 1847 River and Harbor Convention. As a lawyer he had specialized in transportation cases. As a legislator he had been a champion of the Illinois and Michigan Canal. As a youth he had piloted flatboats and river steamers, and he even held a federal patent for a device to lift vessels over sand bars. In 1860 the Republican Party, through its platform and its candidate, promised voters that the national government would be a progressive force in American economic development. The Civil War that followed the Republican victory forced the government to delay delivery on that pledge but only until secessionists were defeated.¹⁴⁶

145 Huston, *Calculating the Value of the Union*, p.274; James McPherson, *Battle Cry of Freedom: The Civil War Era* (New York: Oxford University Press, 1988), 227; also see McPherson’s *The Struggle for Equality: Abolitionists and the Negro in the Civil War and Reconstruction* (Princeton: Princeton University Press, 1964), 11-18 Stephen Middleton, *The Black Laws: Race and the Legal Process in Early Ohio*, eds.by Richard Sission, Christian Zacher, and Andrew Clayton (Athens: Ohio University Press, 2005), 241-49 ; Anna Lisa Cox, “African-Americans,” *The American Midwest: An Interpretive Encyclopedia* (Bloomington: Indiana University Press, 2007), 199-200; Sheriff, *Artificial River*, 16, 24-25 .

146 “Platform of the National Republican Convention Held in Chicago, May 7, 1860” in Theodore J. Karamanski and Eileen M. McMahon, editors, *Civil War Chicago: Eyewitness to History* (Athens: Ohio University Press, 2014), 33-36; Richard F. Bensel, *American Leviathan: The Origins of Central State Authority in America, 1859-1877* (New York: Cambridge University Press, 1990), 69-72; William A. Messe, *Abraham Lincoln: Incidents of His Life Relating to Waterways* (Moline, Ill.: Desaulniers & Company, 1908), 1-74.

The issue of Great Lakes navigational improvements by itself did not cause Lincoln to be elected or the South to secede from the Union. It was, however, an important factor in building the North and West's support for a party that would protect their sectional interests. A quarter-century of Southern opposition to issues of economic development and marine safety on the Great Lakes helped to tip the balance against further accommodation of the slave power. The reckoning was soon in coming for Southern partisans like Jefferson Davis. In 1846 he scuttled any attempt to reconcile the South and the West over the issue of navigation improvements. In 1862 soldiers from the Great Lakes occupied his plantation in Mississippi, scattered his slaves, ravaged his fields, and turned his Greek revival mansion into their field headquarters. When the entire Confederacy was in ashes in 1865, those soldiers could go back to their heartland farms, foundries, docks, and ships confident that the federal government would meet their economic needs.

The Impact of the Civil War on Great Lakes Navigation

The initial impact of the war on the lake marine was to depress shipping. The economy of the region had slumped in 1857 following a national recession, and the secession crisis continued the economic slowdown. It was not until it was clear to the nation that fighting Southern rebellion would entail a long hard struggle, did the economy begin to revive and then thrive under the stimulus of military procurement.

The grain trade dominated the lake marine in the ante-bellum period and the need to feed armies together with crop failures in Europe meant that there was a huge demand for the harvest of the prairie. Chicago was by this time the greatest primary grain port in the world. Its shipments jumped from a pre-war high of 31 million bushels of grain to better than 50 million bushels. Railroads and to a lesser extent canals brought a large part of this grain to the port but 99 percent of wheat and 95 percent of corn left by ship. This surge of grain production not only required the building of grain elevators in Chicago and Milwaukee, the main collection points on Lake Michigan, but also at Detroit and Erie which previously had not figured in the grain trade. Buffalo, where most shipments were destined, built nine new massive elevators during the Civil War, doubling its storage capacity.¹⁴⁷

The tremendous harvests that flowed into the holds of Great Lakes vessels came from a highly productive agricultural sector in the loyal states that became even more productive under the stimulus of a national emergency. This was enhanced by the still expanding number and size of farms in the Northwestern states. Illinois and Wisconsin led the nation in wheat production, the staff of life for the Union Army. During the war Wisconsin alone produced 100 million bushels of wheat. This production occurred when that state, still in the midst of frontier settlement, had sent eighty-thousand men, mostly farm boys to fight in defense of the Republic. One reason for this leap in production was Northern farmer's investment in technology. At the start of the war, the Free States had almost twice the number of reapers and threshing machines per-acre and per farm worker as did its Southern

¹⁴⁷ Emerson E. Fite, "The Canal and the Railroad From 1861 to 1865," *Yale Review*, Vol. XV, No.2, (August 1906), 195-213.

counterparts. This difference increased as the war progressed. During the conflict, Northern farmers added 233,000 new pieces of farm machinery. The Union, in spite having 20 percent of its farm labor supply away in the military, was able to add 2.7 million acres to new farmland. The South was a largely agricultural region, but its prewar farming sector was both labor intensive because of the slavery system, and it was oriented to non-food crops such as cotton, hemp, and tobacco. There was some conversion to food stuffs because of the war, but the Southern military did not benefit from this as much as it needed to because, unlike the North, the South had a weak transportation infrastructure. The combination of the North's Great Lakes shipping, its inter-state and intra-state canals, and its railroads all facilitated the movement of food stuffs from where they were grown to where they were needed. Yet as the war went on, expanding agricultural productivity strained the transport system and encouraged schemes to move grain even more efficiently from west to east.¹⁴⁸

The wartime boom stimulated Midwestern boosters to dust off several long dreamed of waterways projects. For Chicago this meant expanding the Illinois and Michigan Canal that linked Lake Michigan to the Illinois River and hence the Mississippi Valley. The canal was crowded with grain barges during the Civil War. Yet, what many leaders in Chicago had on their minds was not wheat but sewage. By 1862 the Chicago River was choked with the filth of the town's streets and food processing plants. Just between 1861 and 1863 Chicago's meat-packing business, already substantial, tripled in size due to army contracts. Never in the history of the world were so many animals and their filth concentrated in one city. Cattle and swine were delivered by rail and sent to the North Branch of the Chicago River whose banks were lined with distilleries turning grain into whisky. Rather than waste the leftover mash, the distilleries erected feed lots along the river where they recycled the soggy grain to fatten up the livestock. The filth left by the engorged animals was shoveled into the river. The cattle were then driven through the streets to meat-packing houses along the South Branch of the Chicago River where they were cut up and packed in cans or barrels for shipment to the Army. What was left over from the processing was shoveled into the river. Both branches of the river flowed into the main stream, and hence into Lake Michigan from whence Chicago drew its drinking water. For years city officials knew they had an ever-escalating problem, and they had a solution in mind. If the Illinois and Michigan Canal was cut deeper than the level of Lake Michigan, then the clean water of the lake would naturally flow into the river, reverse its course and flush all the filth downstream. Of course, deepening and widening the canal would also allow a greater volume of grain barge traffic, which would be another boon to the city. Therefore Chicago proposed the federal government take on the expensive project of expanding the canal.¹⁴⁹

Chicago's proposal was recognized both in Congress and the press for what it was—local self-interest. The State of New York, in particular, was outraged. Under its own funding it was nearing the

¹⁴⁸ Frederick Merk, *Economic History of Wisconsin During the Decade of the Civil War* (Madison: State Historical Society of Wisconsin, 1916), 17-19; Andrew F. Smith, *Starving the South: How the North Won the Civil War* (New York: St. Martins, 2011), 72-87; Lee A. Craig, "Industry, Agriculture, and the Economy," *The American Civil War: A Handbook of Literature and Research*, edited by Stephen Woolworth (New York: Greenwood, 1996), 506.

end of a major expansion of the Erie Canal to a new width of seventy feet. Undaunted, Chicagoans tried to repeat the success of the River and Harbor Convention of 1847 by organizing a National Ship Canal Convention to be held in the windy city in 1863. They also sought to make allies of their biggest opponents—the legislators of the State of New York. While the Erie Canal enlargement was completed by 1863, the Empire State, it was thought, could be seduced by the resurrection of one of their long-pondered pipe dreams—a canal around Niagara Falls. Of course, there already existed the Welland Canal, but that was on the British side of the border. In the name of national defense, the Chicago convention called for an all-United States route between Lake Erie and Lake Ontario. The Illinois and Michigan Canal enlargement was also refashioned as a military necessity. “The national interest requires that you should have this canal so enlarged as to permit the passage of gunboats from the Mississippi to the Lakes,” an Illinois delegate proclaimed.¹⁵⁰

The national defense argument was strained, but it was not invented out of whole cloth. In 1861 a U.S. naval vessel stopped a British flag ship carrying Confederate agents bound for Europe. By early 1862 the violation of international law provoked a diplomatic confrontation, and Great Britain dispatched eleven-thousand soldiers and a large naval force to its Canadian colonies. Major lake cities such as Buffalo, Cleveland, Detroit, and Chicago had no defense from an attack across the lakes. Hundreds of Union gunboats on the Mississippi and Ohio River could not be brought to bear in the crisis. Wisely, the Lincoln administration offered an apology to England, and the cloud of a foreign war dissipated. That action, however, did not stop Chicagoans and New Yorkers from reanimating the specter of invasion from Canada to strengthen their argument. President Lincoln, who in many ways owed his office to Chicago politicians, played the issue deftly. While he was focused on trying to save the Union, he played along with the boosters. Administration support was made public when Vice President Hannibal Hamlin was dispatched to preside over the Chicago convention. Lincoln then showed he took the deliberations seriously when he commissioned engineer Charles B. Stuart to study its recommendations. That delayed any further action for more than six months. When Stuart delivered his report in March 1864, Lincoln endorsed it and sent it to Congress. A bill was eventually introduced, but with the trauma of the war reaching its climax and a presidential election underway it did not advance. The war ended without either the Niagara or the Illinois canals receiving national support. After the war, Chicago renewed its efforts to clean sewage from its rivers by using local resources, but in a way that would have a controversial effect on Great Lakes navigation.¹⁵¹

Rising freight rates were one of the reasons farmers supported Chicago’s attempt to improve its canal. The heavy production and demand for grain during the war and the rising mining and manufacturing sectors strained available shipping on the lakes as well as the canals. The best of the Great Lakes

150 *Proceedings of the National Ship Canal Convention Held at the City of Chicago June 2nd and 3rd, 1863*, (Chicago: Tribune Job Printing, 1863), 28; *The Niagara Ship Canal Its Military and Commercial Necessity* (New York: n.p., 1863); *New York Times*, 30 May 1863.

151 McPherson, *Battle Cry of Freedom*, 388-91; Charles B. Stuart, *Proposed Improvements to Pass Gunboats from Tidewater to the Northern and Northwestern Lakes, Message From the President of the United States*, 38th Congress, 1st Session, House of Representatives, Executive Document 61, March 1864, 1-28.

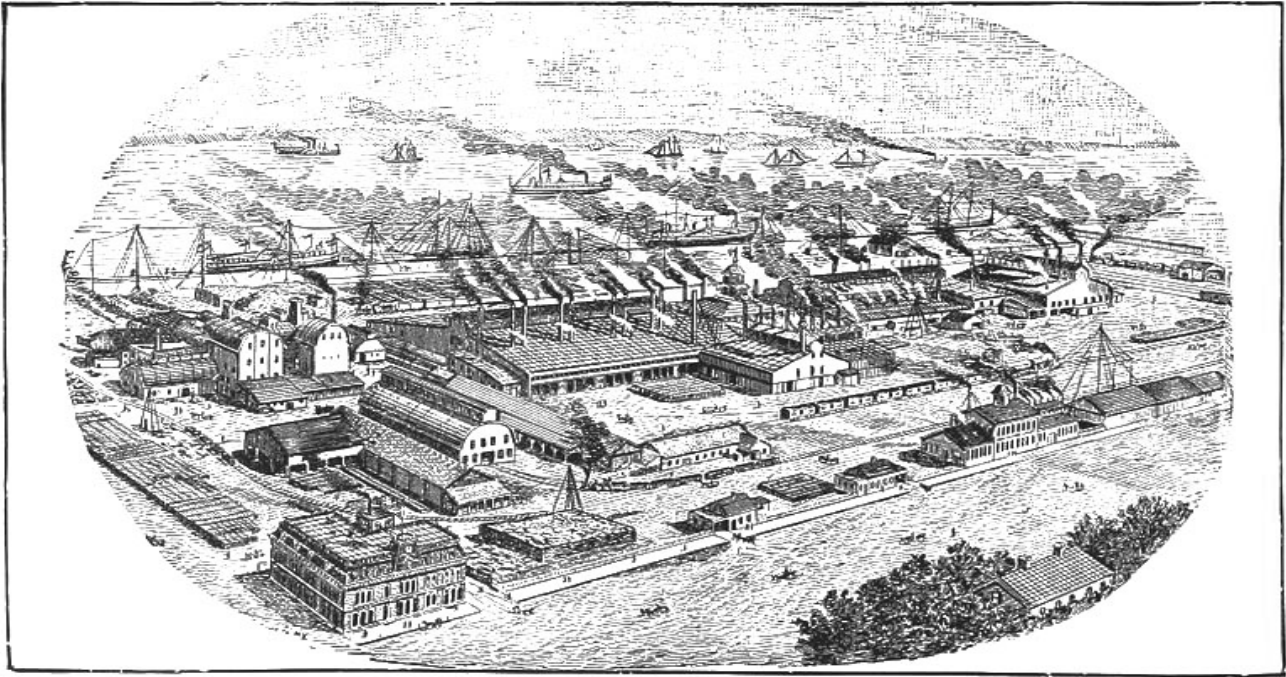


Figure 16. Eber Brock Ward's Eureka Steel Works.

schooners were devoted to the grain trade. Water would ruin a grain cargo; so stout, dry ships were tied up on the Lake Michigan to Buffalo route. One effect of this was to retard the rapid development of copper and iron production in the Lake States during the Civil War. Mining on the Lake Superior slope of Michigan's Upper Peninsula began in the late 1840s and really took off following the 1855 opening of the Sault Ste. Marie Canal. The Keweenaw Peninsula boasted the most productive copper deposits. The industry grew slowly in the 1850s, but when the military placed orders for brass buttons, cannon barrels, and belt buckles, the price of copper jumped from nineteen cents per pound to forty-six cents. The number of companies purporting to operate in the district increased from fourteen to sixty, but actual production fell due to a severe labor shortage. An important impact of the war was to improve mining methods and to introduce technology below ground. The Marquette Range east of the Keweenaw was the center for early iron mining. In spite of extensive investment in numerous mines and a railroad after more than a decade, there had been no capital returns on iron district investments. The Civil War changed this. In 1862 the Jackson Mining Company declared its first dividend. The Cleveland-Cliffs Mining Company also declared a profit when it saw output jump from 12,000 tons of ore per year to a wartime average just less than 45,000 tons. Investors took notice, and in 1864 alone nine new mining companies were established in the district. Most of the iron ore was carried via schooners because ore docks at Marquette, Michigan, the principle iron port on Lake Superior, could drop ore directly into their hulls. This ease of loading was not possible for most steamers because they did not have hatches on their decks and instead loaded cargo through gangways on their sides. Detroit and especially Cleveland were the destinations of the early ore ships. To unload a schooner with a

300 ton cargo could take as long as three days with the ore laboriously shoveled out of the hold then into wheelbarrows. The first experiments with mechanical unloaders did not begin until 1867. The transportation of Michigan copper and iron ore to the ports and furnaces of the lower lakes greatly expanded shipping on Lake Superior.¹⁵²

During the Civil War, the cities of the Great Lakes region, particularly Chicago, Detroit, and Cleveland, moved from being mere transshipment hubs for copper and iron ore to developing the means of industrial production. The war stimulated industrialization through the reliance of the Union Army upon rail transport to move and supply armies. The Northwest Manufacturing Company in Chicago illustrates how this happened. In 1855 Richard Teller Crane founded the company as a small brass foundry. He was at first the sole employee and saw church bells as his main market. As Chicago grew to become the rail center of the West, his company began to focus on making brass fittings for rail cars and steam engines. During the war his company doubled in size and production and had to triple the size of its plant. Iron foundries were even more directly influenced by the war. The greatest manufacturing need was for iron rails. By 1865 the production of rails had increased 250 percent over 1850s levels. The intensive use of railroads to answer military needs and the simultaneous construction of the Central Pacific and Union Pacific Railroads exacerbated normal production. This led to critical experiments in manufacturing long-lasting steel rails.¹⁵³

The strong connection between Great Lakes shipping, mining, and manufacturing is illustrated by the role played by Eber Brock Ward in building the steel industry along the lakes. After growing up in a Lake Huron lighthouse and going before the mast as a cabin boy, Ward became a ship builder and the owner of one of the largest fleets of Great Lakes steamboats. His early interest in iron-making stemmed naturally from his involvement in shipbuilding. In 1848 he supervised the forging of some of the first iron ore to come out of Michigan, which was used to make the walking beam for his steamer *Ocean*. Thereafter, he expanded his interest in iron. In 1853 he founded the Eureka Iron and Steel Works just north of Detroit. Here he experimented with using several new processes that would blast hot air on molten iron to burn off impurities and resulting in the stronger, lighter, and more durable product known as steel. Although he was a man of limited education, he believed in bringing science to bear on business. He was the first American iron maker to use chemists to test the suitability of ore for steel-making. In 1858 he built a second plant on the North Branch of the Chicago River. Here the focus was on rolling a steel rail, a critical need, yet up to this time only available by import from Great Britain. Stimulated by the heavy wartime demand, Ward's North Chicago Rolling Mill was finally able to produce the first U.S. made steel rail in May of 1865. This steel rail became the cornerstone of the

152 Charles Hyde, *Copper For America: The United States Copper Industry from Colonial Times to the 1990s* (Tucson: University of Arizona Press, 1998), 40-42; Terry Reynolds and Virginia Dawson, *Iron Will: Cleveland-Cliffs and the Mining of Iron Ore, 1847-2006* (Detroit: Wayne State University Press, 2012), 42-3; .D.H. Merritt, "A History of the Marquette Ore Docks," *Michigan History Magazine*, Vol. III, No.3, (July 1919), 424-30; "History of the Iron Ore Trade," *Cleveland Memory Project*, Cleveland State University Library, <http://www.clevelandmemory.org/glihc/oretrade.html>, accessed December 2014.

153 Theodore J. Karamanski, *Rally 'Round the Flag: Chicago and the Civil War* (New York: Rowman & Littlefield, 2006), 172; W. Bruce Bowlus, *Iron Ore Transport on the Great Lakes: The Development of a Delivery System to Feed American Industry* (Jefferson, NC: McFarland & Company, 2010), 92.

Great Lakes steel industry and Ward's plant eventually grew into the mammoth United States Steel Corporation.¹⁵⁴

The growth of the mining industry, industrial manufacturing, even the expansion of railroads all stimulated lake shipping. The lake marine was not a backward industry pushed aside by the juggernaut of the iron horse. Rather Great Lakes ships, even sailing vessels, continuously adapted to new technologies and changing trade patterns. Rails and sails had missions that were more complementary than competitive. Bulk cargoes such as grain or ore, then as now, could be most cost effectively moved by water. It could cost twice as much to ship grain by rail as by lake schooner. Water transport generally took longer, but the movement of bulk cargoes was not especially time sensitive. The movement of specialized manufactured goods and passengers created situations where speed of transport mattered greatly. Hence, Great Lakes ships retained the edge in bulk transport, while during the 1850s the railroads captured the lion's share of the passenger traffic. By 1861 three separate railroad lines paralleled the New York City to Chicago Great Lakes-Erie Canal water route. The competition offered by the waterway held down railroad rates and favored the economic development of businesses located in those areas. Chicago, for example, had some of the lowest railroad shipping rates in the nation because its large fleet of ships prevented railroads from monopolizing access to Eastern markets. Historian William Cronon has demonstrated that during the April-November Great Lakes shipping season railroads entering Chicago from the East slashed their shipping rates to secure a portion of the grain trade. When vessels withdrew due to winter gales, the railroads rates would more than double. This process of radical rate fluctuation was a feature of the Eastern railroads entering Chicago. Not just season and shipping affected their rate structure as each of the three railroads had similar beginning (the Atlantic Coast) and end points (Chicago), which meant they had to compete with each other as well as with lake shipping. On the other hand, railroads that radiated out from Chicago to the north, south, and west all brought the hauls to the Lake Michigan port, which greatly enhanced the city's maritime interests. Milwaukee and Toledo, to a lesser extent, also enhanced the importance of their ports by railroad hinterlands to their west. At the other end of the lakes, Buffalo's emergence as a major railroad hub only enhanced the business of its great grain port. By 1887 Buffalo had eleven railroads radiating out from its port tying the harbor to Canadian cities, the Atlantic Coast, and the vast interior south of the lakes.¹⁵⁵

The degree to which the lake marine and the railroad complemented one another reflects a harmonization of the U.S. economy that began to emerge during the Civil War. This was symbolized by the adoption of a standard rail gauge by the Congress when it offered generous financial support for the Pacific Railroad and the creation of national banking system which triggered the move toward

154 George A. Newett, "A History of the Marquette Iron Range," *Proceedings of the Lake Superior Mining Institute*, Vol. XIX, (1914), 300-1; "The Real Builders of America: Eber Brock Ward," *The American Marine Engineer*, Vol. VI, No. 4, (April 1914), 9-11.

155 William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W.W. Norton, 1991), 86-90; James Lester Strum, *Railroads and Market Growth: The Case of Peoria and Chicago, 1850-1900*, (MA Thesis, University of Wisconsin, Madison, 1965) ; Isaac Lippincott, *Economic Development of the United States* (New York: D. Appleton and Company, 1921), 542-43; Nuala Drescher and James Martin-Diaz, *Engineers for the Public Good: A History of the Buffalo District, Army Corps of Engineers* (Buffalo: U.S. Army Corps of Engineers, 1982), 154.

a national paper currency. Historian Peter D. Hall commented on the centralizing impact of the American Civil War on the nation. “The war changed everything,” he wrote, “the large scale integration of transportation, communication and credit facilities, and the reorganization of government agencies were...at last leading Americans towards the achievement of functional nationality.”¹⁵⁶

“Rules of the Road” For Lake Commerce

On the night of September 8, 1860, a brightly lit steamer surged through a Lake Michigan thunder storm. On board were at least 350 people exhausted from a day of marching, dancing, and partying. They were about to be involved in an incident that would alter Great Lakes navigation regulations. Most of those on board were Milwaukee residents who had come down to Chicago for the day to cheer on their candidate for president, the “Little Giant” Stephen A. Douglas. Rather than take the train, they had booked passage on the *Lady Elgin* so they could enjoy dancing and singing on their way home. By 2:30 A.M., however, they likely had their fill of drink, and the pitching ship made dancing dicey and dinner difficult to keep down. Suddenly out of the dark lake, the steamer’s captain saw a heavily laden lumber schooner careening toward his ship. The schooner *Augusta* tried to pass the *Lady Elgin* on her starboard side. The steamer’s helmsman may have anticipated the schooner would pass on the more customary port side. In any event in the darkness and confusion the *Augusta* struck the steamer at her port paddlewheel. The wind and rough seas quickly parted the ships with both captains initially thinking the schooner had taken the worst of the incident. Then the *Lady Elgin* began to list and in short order began to break up. Perhaps as many as 385 passengers and crew went into the lake that night, no passenger manifest was taken, yet only ninety-eight staggered ashore at dawn.

Darius N. Malott, the Captain of the *Augusta*, was brought before a Cook County Coroner’s Jury to explain what had happened. The schooner master and his crew were admonished for not keeping a better lookout, yet otherwise were found to largely free of blame. There were no formal rules that guided mariner’s actions upon the approach of another vessel. It was commonly considered that the steam-powered ship should give way to a sailing ship since mechanical propulsion gave the steamer much more maneuverability. Britain and France had already adopted formal rules to govern maritime encounters, but the United States Congress had always been deterred by businessmen and sailors, who sought to avoid government regulation. The terrible loss of life from the *Lady Elgin* collision and the fact that there were then better than 1,700 commercial vessels on the Great Lakes—not to mention hundreds of fishing boats and pleasure craft—finally impelled action. Federal rules passed by Congress in 1864, required all ships to post a white light near the top of the foremast. A green light was to be posted on the starboard side and a red light to port. All vessels were further required to have a fog signal. Clearly spelled out in the rules were clauses detailing how vessels should maneuver when

¹⁵⁶ Peter D. Hall, *the Organization of American Culture, 1700-1900: Private Institutions, Elites, and the Origins of American Nationality* (New York: New York University Press, 1982), 242-45.

crossing, approaching, or passing one another. The new law signed by President Abraham Lincoln was a clear attempt to use law to help bring order to the burgeoning maritime frontier of the inland seas. Like most efforts to legalize behavior it was not a complete success. Confined waters, numerous vessels, and unpredictable weather continued to make collision a real danger. In 1871 alone there were at least 225 ship to ship collisions on the lakes.¹⁵⁷

Great Lakes Lighthouses in the Civil War Era

In 1866 Aaron A. Sheridan, late corporal in Company E of the 13th Illinois Infantry, hopped out of a boat and on to the broad beach of South Manitou Island. Perhaps he held out his strong right arm to his wife Julia and helped her ashore. It would have made him feel good to be able to do that, perhaps more than other men, because Sheridan's lower left arm had been shattered by a rebel bullet in the November, 1863, Battle of Ringgold in northern Georgia. Keeping the arm, getting his health back, and adjusting to his disability had been a long battle. Coming to northern Lake Michigan to be the keeper of the South Manitou Island Lighthouse marked his success in a struggle to live a normal life,

to be a provider, a husband, a father, a man.

Aaron Sheridan was just one of many Civil War veterans who became lighthouse keepers in the wake of their military service. Many of these were men like Sheridan, who had suffered severe wounds in combat, but had proven themselves dedicated to their duty. Barry Litogot was twice wounded before being awarded the keepers post at Mamajuda Island in the Detroit River. James S. Donahue, like Sheridan, had suffered a permanent disability while leading a company in the 8th Michigan Infantry in the 1864 Overland Campaign. Wounded in the thigh, he lost most of one leg. He was assigned to the South Haven lighthouse. All across the Great Lakes—at Cana Island Light, Potawatomi Island Light, Squaw Point Light, Rock Island Light, Fairport Harbor Light and scores of other stations on the inland seas and the nation's sea coasts—Civil War veterans were given preferential consideration

for keepers jobs. This comported with an earlier preference given to Revolutionary War and War of 1812 veterans. The Civil War, however, had a much broader and deeper impact on American society. The three-million Union Army veterans were much more numerous, and the wounded, many with amputated limbs, were much more visible to the broader society. Through the Grand Army of the Republic (GAR) and smaller regimental associations, Civil War veterans were organized and pushed



Figure 17. Aaron Sheridan, disabled veteran and lighthouse keeper.

the nation to embrace its first genuine social welfare programs. Congress created and gradually broadened a system of pensions for fallen, wounded, and aged veterans as well as their dependents. It was another manifestation of a more active and engaged federal government.¹⁵⁸

While the Lighthouse Board was inclined to reward veterans where possible it would not do so at the expense of the efficient management of vital navigational aids. When the one-legged veteran James Donahue applied for a keeper's position, he was initially rebuffed by the board. "Mr. Donahue, we appreciate your service to our country, but we question your ability to carry out the duties of a lighthouse keeper," the Lighthouse Board secretary wrote. "The position requires strength and coordination, which would be very difficult for a person crippled like yourself." Donahue, however, did not see himself as an invalid as he made clear to the Board. "Gentlemen, it is true that I was twice injured in the war, the second time losing a leg in the Battle of the Wilderness, however, I am not crippled, as you assert," he wrote. "I am capable of carrying out any and all duties required of a lighthouse keeper and will gladly prove it to you if you will give me the opportunity to serve my country in this manner." He won his appeal and was given the South Haven Lighthouse. It was a pier head light. A seventy-five foot long catwalk led out across the pier to the light. Every evening regardless of waves, ice, or storm Donahue had to make his way out to the tower and climbed the thirty feet to the top to light the beacon. He unfailingly did this duty with his crutch for thirty-six years. He also performed heroically rescuing citizens in distress. During his long career, he pulled fifteen people from the Lake Michigan surf, and he was awarded the government's silver lifesaving medal.¹⁵⁹

Among the Civil War veterans who had the greatest impact on Great Lakes lighthouses and navigation aids was Orlando Poe. When the war began, he was a First Lieutenant working on the U.S. Lake Survey. From 1861-1865 he saw active service as a combat officer first leading the 2nd Michigan Infantry in the Peninsula Campaign, then as a Brigade Commander during the Second Bull Run Battle, and finally as a military engineer in the Western theater. Eventually, he joined William T. Sherman's staff as chief engineer. It was Orlando Poe who organized the burning of Atlanta, destroying the railroad and manufacturing facilities of the city—although he regretted that some civilian residences were also destroyed by undisciplined troops. At the war's conclusion, Poe was awarded the honorary rank of Brevet Brigadier General. With a regular Army rank of Major, his initial post-war job was Chief Engineer for the Lighthouse Board. In this capacity, he was in almost constant motion traveling the country supervising the refitting of lighthouses that had deteriorated during the war and overseeing the construction of new beacons. He held this position for five years all the while looking for an opportunity to return to the Great Lakes region where he had worked before the war. During his

158 Claire Prechtel-Kluskens, "A Reasonable Degree of Promptitude": Civil War Pension Application Processing, 1861-1885," *Prologue*, Vol. 42, No.1, (Spring 2010) <http://www.archives.gov/publications/prologue/2010/spring/civilwarpension.html>, accessed December 2014.

159 Jay C. Martin, *James S. Donahue, Lighthouse Keeper* (Bowling Green, Ohio: n.p., 1989), 1-29 ; *Biographical and Portrait Record of Kalamazoo, Allegan, and Van Buren Counties, Michigan* (Chicago: Chapman Brothers, 1892), 355-56 ; Timothy Harrison and Jeannette Stevie, "South Haven Lights: Pages From Their Past," *Lighthouse Digest* (October 1999) <http://www.lighthousedigest.com/Digest/Edition.cfm?date=1999%2D10%2D01%2000%3A00%3A00%2E0>, accessed December 2014 ; Marilyn Turk, "The Abnormal Lighthouse Keeper," *Pathways of the Heart*, <http://pathwayheart.com/the-abnormal-lighthouse-keeper/>, accessed December 2014.



Figure 18. General Orlando Poe.

time with the Lighthouse Board, he had a chance to learn and then master the intricacies of lighthouse construction. He visited many poorly built stations, and had a chance to inspect some of the recent projects of the Lighthouse Board's best pre-war engineers.¹⁶⁰

In 1870 Poe returned to Detroit as the Chief Engineer for the 11th Lighthouse District that included Lakes Michigan, Huron, and Superior. More than any other nineteenth-century engineer, Poe made vital contributions to Great Lakes navigation. His first stint as the lead engineer in the district lasted only three years. He left the region from 1873 to 1883 to serve as aide-de-camp to William Tecumseh Sherman when that general commanded the United States Army. He then returned to the Great Lakes and resumed his work with the 11th District. Among his notable accomplishments during this final lakes posting was the expansion of the Sault Ste. Marie locks. He died in

1895 from an infection contracted during a minor accident at the Soo construction site.¹⁶¹

Poe supervised numerous navigational aid projects, but he was most famous for his design of a series of lighthouses on the Great Lakes in the post-Civil War era. Only six lighthouses had been built on the lakes during the war, and the expansion of shipping and settlement required the Lighthouse Board to aggressively expand construction of new lights in the 1870s. Poe's eight Great Lakes lights were not hasty, stop-gap efforts. The renowned "Poe lights" are distinctive for their ornate style, architectural integrity, and navigational utility. It is likely that Poe's design was influenced by light towers he visited

¹⁶⁰ Paul Taylor, *Orlando M. Poe: Civil War General and Great Lakes Engineer* (Kent, Ohio: Kent State University Press, 2009), xvii-xviii, 221-31.

on the Atlantic Coast. During the late 1850s, Army engineers, working with the Lighthouse Board using modern construction techniques and a knowledge of navigational needs, began to construct very tall brick coastal lights. George Gordon Meade pioneered these in 1857 when he designed the Absecon Lighthouse near Atlantic City, New Jersey. His tower was 171 feet tall, more than twice the height of anything built under Stephen Pleasonton's benighted regime. Poe's Great Lakes towers were the tallest on the inland seas, but they did not need to be as high as Atlantic Coast towers. Poe's designs also reflected an architectural refinement and an eye for convenience and efficiency absent in the tall towers of the ante-bellum era. The first of these distinctive lighthouses was the 1870 Presque Isle Light Station. Poe sited the light on a peninsula near the northern reaches of Lake Huron. He designed a 109-foot tower that could be seen by ships far out on the lake. The graceful structure rested securely on a limestone foundation sunk ten feet into the earth. The conical tower rose from a base a

Library of Congress, HABS IL-1212

NORTH ELEVATION

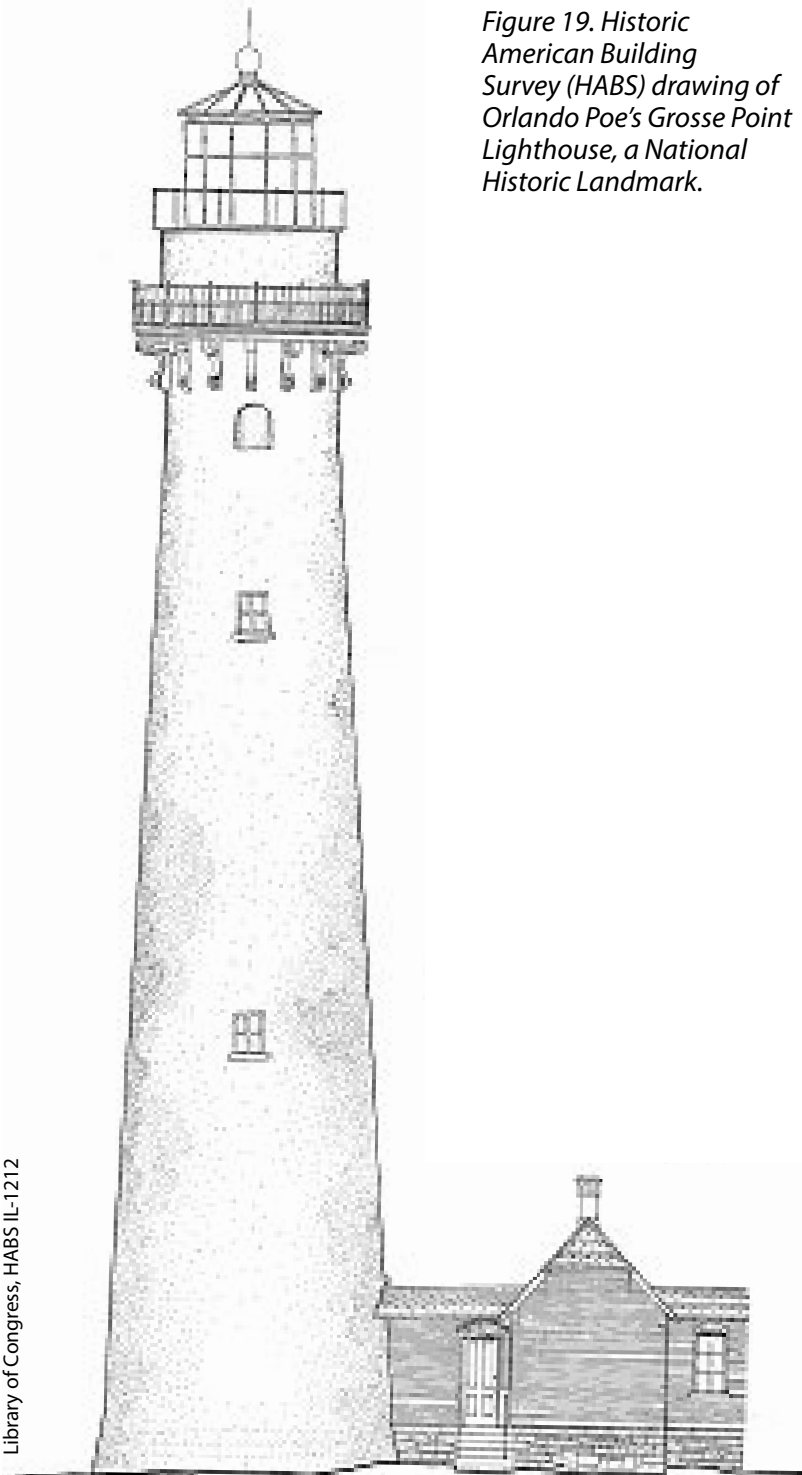


Figure 19. Historic American Building Survey (HABS) drawing of Orlando Poe's Grosse Point Lighthouse, a National Historic Landmark.

little over nineteen feet in circumference with brick walls five-feet thick, and it tapered to a twelve-foot diameter at the watch room. A 144-step iron spiral staircase led up to the top and a third-order Fresnel Lens. A sixteen-foot enclosed passageway connected the one-and-one-half-story brick keeper's house to the tower, a feature no doubt much appreciated by generations of keepers when autumn storms

swept down. The station was taller than any other lighthouse on the Great Lakes, and its arched Italianate windows gave it an elegant look seldom found in utilitarian structures. His keeper's house at Presque Isle and for his other lights were designed with an eye for both comfort and utility. They tended to be two-stories with an attic and a basement where oil could be stored.¹⁶²

Poe used this same design when he was assigned to put a new light at South Manitou Island. The light was one of the key beacons along the Manitou Passage, the route followed by nearly all shipping moving from the mouth of the lake to Chicago or Milwaukee. Two other lighthouses had been built on this vital site, the most recent in 1858. But the short tower which stood atop a two story keeper's house and a poor lamp ensured the light was hard for sailors to spot. Poe knew the Presque Isle Lighthouse tower design would solve those problems. A much more difficult problem was the sandy soil of South Manitou Island. To ensure the tall brick tower he planned would rest on a secure foundation, Poe had his crew drive sixty-foot oak pilings deep into the ground. Then atop those beams he built below grade a fifteen-foot brick foundation. From this base in 1872 rose a 104-foot brick tower. With slight variation this design was repeated over the next two years at the Outer Island Light Station (Apostle Islands), Au Sable near Grand Marais on Lake Superior, Little Sable Point and Seul Choix on Lake Michigan, and Grosse Point just north of Chicago. In 1880, the Wind Point Light near Racine, Wisconsin, also followed the same design.¹⁶³

Poe's other outstanding contributions to Great Lakes navigation aids was his construction of the Spectacle Reef and the Stannard Rock Lighthouses. The Spectacle Reef was a rocky shoal between six and seven feet under the water set in the channel that ultimately connected the Straits of Mackinac with the St. Mary's River and the route to Lake Superior. As vessels on the lakes became larger and had deeper drafts, the shoal became more and more of a threat to navigation. In 1867 two schooners were wrecked on the reef with a total loss. The next year a buoy was placed there as a stop-gap measure and the Lighthouse Board requested Congress to authorize \$300,000 for a lighthouse to be placed on the reef, a hazard "more dreaded by navigators than any other danger now unmarked throughout the entire chain of lakes."¹⁶⁴ The massive appropriation was recognition that building a lighthouse above a shoal in the open lake was a major engineering challenge. Poe's design would have to withstand powerful gales in autumn and the relentless assault of thick ice floes in winter. The construction project proceeded like a siege with a small army of 142 workers making incremental progress. First they cleared the wreckage of the schooner *Nightingale*. They then towed a precisely-measured combination wooden crib and coffer dam from its construction site 17 miles away, sank it on to the shoal and anchored it with 1,800 tons of rock. Next Poe's men laid down a solid base of limestone anchored by

¹⁶² Taylor, *Orlando Poe*, 236-37; Larry & Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 184 ; Russ Rowlett, "Early Classic Brick Towers, 1850-1869," *The Lighthouse Directory*, <https://www.unc.edu/~rowlett/lighthouse/types/earlymodernbrick.html>, accessed, December 2014.

¹⁶³ Taylor, *Orlando M. Poe*, 237; Kenneth J. Vrana, editor, *Inventory of Maritime and Recreation Resources of the Manitou Passage Underwater Preserve*, (East Lansing: Michigan State University, 1995); Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 333.

¹⁶⁴ Lighthousefriends.com, "Spectacle Reef, MI," citing the Lighthouse Board, *Lighthousefriends.com*, <http://www.lighthousefriends.com/light.asp?ID=708>, accessed August 8, 2016.

iron bolts and Portland cement. By the summer 1872 the tower had been raised to a height of better than twenty-feet when the Manitou of Lake Huron launched a counter attack. A September storm caused considerable damage and was followed by a severe winter. When Poe and his men returned to the site in the spring, huge blocks of ice were piled pyramid-like around the tower. Days were spent pulling and cutting their way through the white wall just to reveal the lighthouse. That summer they raised the tower to its full ninety-three feet. The stone for the solid base had been barged to the site from Marblehead, Ohio, and was the same material as was used for the lighthouse there. The upper tower had an exterior stone wall and the interior was lined with brick. The upper five stories of the tower were divided

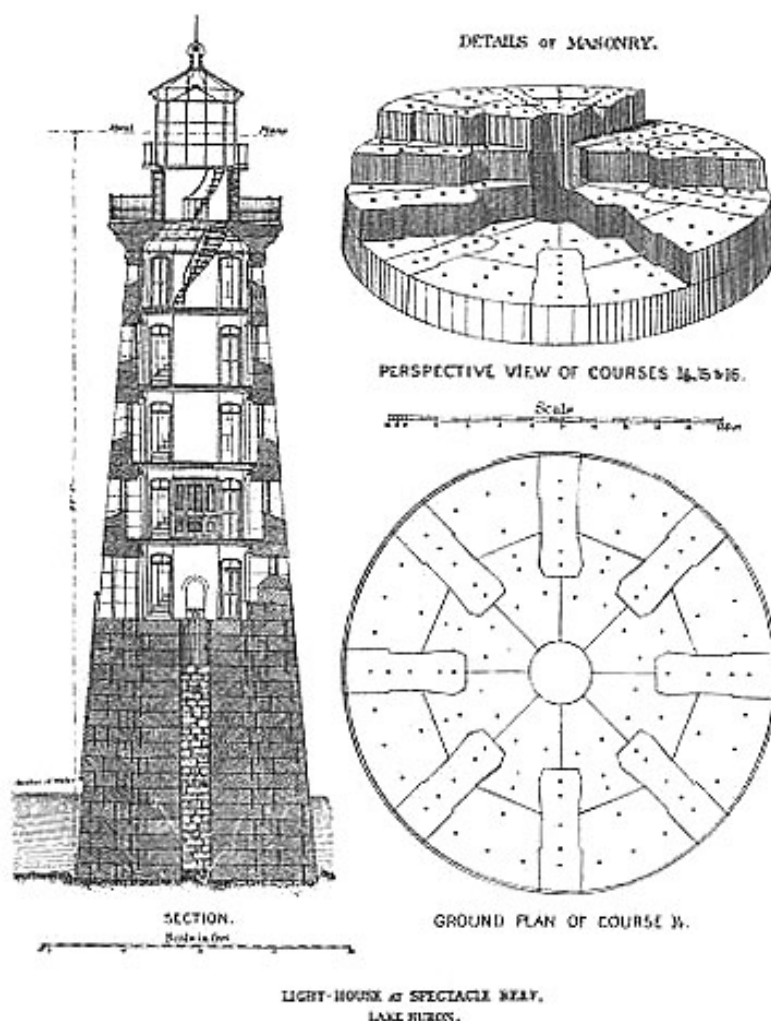


Figure 20. Poe's design for Spectacle Reef Lighthouse.

into dwelling quarters and storage areas stacked one atop another. The light was equipped with a powerful second-order Fresnel lens in June of 1874. The project cost more than \$400,000, making it one of the most expensive lighthouses ever built in the United States. It was, however, a marvel of engineering in which the Lighthouse Board took great pride. The slipshod ways of the Pleasonton era were clearly in the past and engineers from around the world took note of Poe's accomplishment. Crib (or submarine) foundations had been in use since 1832, and the integration of a coffer dam to facilitate construction pre-dates such use at Spectacle Reef. However, Spectacle Reef proved to be one of the two most significant crib foundation-type lighthouses ever constructed, and crib foundations would be used extensively on the Great Lakes.¹⁶⁵ As late as the 1893 Columbian Exposition, the Spectacle Reef Lighthouse occupied a place of pride in the Board's exhibit.¹⁶⁶

¹⁶⁵ The earliest application of a coffer dam is attributed to the 1873 Craighill Channel Lower Range Rear Lighthouse in Maryland. Clifford, *Inventory of Historic Light Stations*, p.14, 28-30.

¹⁶⁶ Taylor, *Orlando M. Poe*, 233-34; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 189-90; Terry Pepper, "Spectacle Reef Lighthouse," *Seeing the Light*, <http://terrypepper.com/lights/huron/spectacle/index.htm>, accessed December 2014.

The techniques improvised by Poe at Spectacle Reef were soon put to use on an even more difficult project on Lake Superior; and one which became the other most significant crib foundation-type light ever built.¹⁶⁷ An underwater mountain with a summit nearly a mile tall rises from the depth of the lake to within four feet of the surface. This hazard was unfortunately situated within the shipping lane of vessels leaving the western end of the lake and bound for the Sault Ste. Marie locks. An army engineer characterized it as “an object of great concern and terror, especially in dark nights and the almost interminable fog which prevails.” By 1866 the Lighthouse Board considered the shoal the most dangerous obstacle to maritime travel on Lake Superior,¹⁶⁸ but it would not be until 1877 that Congress authorized funding to begin lighthouse work at the site. Complicating the task was the fact that Stannard Rock was twenty-three miles from the nearest land and almost fifty miles from the nearest port. During the first two months of work at the site more than forty days were lost because heavy seas drove the construction team away from the site. Numerous shipments of stone or supplies were lost to Lake Superior’s notorious gales. Captain John A. Bailey, who had worked with Poe on Spectacle Reef, headed the Stannard Rock project. Five years of dogged effort were needed to build the lighthouse. The protective pier at the tower’s base was anchored with 875 tons of rock quarried on Huron Island near Marquette, Michigan, where in 1868 an earlier lighthouse had been built. The actual stone for the monolithic tower came once again from Marblehead, Ohio. The 102-foot tower with a powerful second-order Fresnel lens was completed for a cost of \$305,000.

Crib foundation, masonry lighthouses were not the only construction type aids to navigation built at this time. Between the 1830s and 1840s, advances in construction technology included the use of wrought-iron and cast-iron plate for towers. Cast-iron lighthouses were less expensive to build, lighter than masonry, could be shaped into various forms, were water tight, and had a slow rate of deterioration. However, they were not suitable for exposed locations, and so such towers were often used for harbor breakwater lights or range lights. Another good feature of these structures was that the various parts were bolted together, and could be disassembled and moved as needed. Brick linings provided additional stability and insulation. Architectural and stylistic detailing, such as doors, windows, brackets or a pediment, could be cast into a plate to provide more elaborate designs. Another new industrial age tower were the skeletal tubular cast-iron lighthouses. These consisted of a central iron cylinder that contained a vertical stairway leading to a lantern room. Four to eight external slanting structural skeletal peripheral columns provided stability. This type of relatively light-weight light functioned well in soft or swampy location, supported by pile foundations. After 1900, iron was only used in special situations, although cast iron continued to be used for lanterns into the 1930s. Steel plates and steel rings would be used in place of cast-iron plates; with its greater tension and residual strength, steel would also be used in the twentieth century for truss and skeletal frame elements. Caisson foundations used the same pneumatic technology famously used for the Brooklyn

¹⁶⁷ Clifford, *Inventory of Historic Light Stations*, p.28.

Bridge to pneumatically force water from the foundation location. The first application of caisson technology for lighthouse construction in the United States was for Lake Michigan's Waugoshance Light.¹⁶⁹

Following the successful construction of the Stannard Rock Light, Keepers there manned the most remote and isolated lighthouse in the United States. They were completely out of sight of land. In keeping with the hardship nature of the post, no families were allowed here and even many of the all-male crews had trouble with the posting. The station became known as the "loneliest place in America." A small library on the tower's fifth level was solace for some, but at least one keeper, perhaps not much of a reader, had to be removed from the station in a straight-jacket.¹⁷⁰

Naturally, having a spouse or a family on station could be a great source of comfort and well-being for a light keeper. For many of the wounded Civil War veterans, their wives were also practical partners in the operation of the beacons. Aaron Sheridan, with one good arm, was not only helped by his wife through her domestic duties but she was also the official assistant keeper of the station. This was not at all unusual. Barney Litogot was a twice-wounded Civil War veteran. He served at Mamajuda Island where his wife Caroline was the official assistant keeper. Litogot's wounds had been severe, and after several years of duty at the light he died. When the Lighthouse Board made plans to replace Caroline Litogot, Michigan Senator Zachariah Chandler sent an immediate telegraph to the Secretary of the Treasury, which oversaw the board, to "suspend action on the removal of Mrs. Litogot." In a follow up letter, he explained that Caroline had really been the *de facto* keeper for some time "her husband being disabled from wounds received in the war from which effects he died." According to Senator Chandler, "The vessel men all say that she keeps an excellent light, and I think it very hard to remove a woman who is faithful and efficient, and throw her upon the world with her children entirely destitute when her husband lost his life in defense of the union."¹⁷¹

Having a spouse as an official assistant keeper was a boon to the family economy. While lighthouse keepers did not enjoy a princely salary, they did earn a better than average wage. In the post-Civil War era, a keeper generally earned about \$600 a year. Considering the job came with free housing, it was good pay. A lake sailor was happy to make only \$1.50 a day. When a keeper's wife became the assistant, another \$400 annually was added to the family income. Aaron and Julia Sheridan used their extra income to improve their homestead claim on South Manitou Island. Julius William Warren, the keeper at Cana Island Lighthouse in Wisconsin, and his assistant Sarah Warren also invested in a farm. After only a few years in the lighthouse service, they built the finest home on Cana Island and retired to a life of farming.¹⁷²

¹⁶⁹ Clifford, *Inventory of Historic Light Stations*, p.14-29.

¹⁷⁰ O'Brien, *Guardians of the Eighth Sea*, 20-22; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 401-02; Hyde, *Northern Lights*, 169-71.

¹⁷¹ Zachariah Chandler to B.H. Bristow, 24 July 1874, printed in Victoria Brehm, editor, *The Women's Great Lakes Reader* (Duluth: Holy Cow Press, 1998), 241-42.

¹⁷² Brenda Wheeler Williams, Arnold Alanen, and William Tishler, *Coming Through with Rye: An Historical Agricultural Landscape Study of South Manitou Island, Sleeping Bear National Lakeshore, Michigan* (Omaha: Midwest Region, National Park Service, 1986), 35; Barb and Ken Wardius, *Cana Island Lighthouse* (Chicago: Arcadia Publishing, 2006), 42-45.

Even when women were not officially recognized for their work at the station, they often performed work crucial to the operation of the station. The South Haven pier-head light was kept by James S. Donahue, a disabled Civil War veteran. When he was away from the station to get supplies or to attend to business in town, his wife did his job. On one occasion, she spent a large part of the night in the tower operating the fog horn to help bring a distressed vessel into harbor. More often she kept vigil for her husband. When storms battered the tower, the catwalk back to the house was too dangerous to use and the keeper had to stay there to be sure that the light was not extinguished. His wife sat by her window looking for his silhouette in the watch room making sure he was safe. When Clement Van Riper, the keeper at Beaver Island disappeared in a Lake Michigan gale in a vain attempt to aid a storm-ravaged vessel, his wife Elizabeth kept the light operational that night and until the Lighthouse Board could be notified. Although she confessed to being “weak with sorrow,” she was animated by the knowledge that the beacon played a crucial role for sailors “out on the dark treacherous waters who needed to catch the rays of the shining light from my lighthouse tower.” She knew exactly what had to be done because her husband had often been in poor health, and she had frequently taken the task of climbing the steps to tend to the lamps and clean the lens. So well did she manage the station after her husband’s death, the board offered her the official appointment as keeper. She accepted and at Beaver Island and later at Little Traverse she devoted a total of forty-four years to managing navigation lights.¹⁷³

There were only a handful of female lighthouse keepers on the Great Lakes and most of these were widows of lighthouse keepers or related to the previous keeper. Anastasia Truckey was married to the Marquette Harbor Lighthouse keeper when the Civil War broke out. Although he was the father of four children, Truckey enlisted in the 27th Michigan Infantry. For the three years he was in the service, Anastasia maintained the lighthouse and looked after her children. While the dual responsibility was no doubt taxing, maintaining the family’s income base while he was gone was essential. Georgia Stebbins was the widowed daughter of the keeper of Milwaukee’s North Point Lighthouse. She lived with her father at the lighthouse for seven years. As his health declined, she took over more and more of the daily duties of the keeper: Trimming the wicks, lighting the lamps, cleaning the lens and the windows. In 1881 the district inspector removed her father and appointed her the keeper. She held the job for ten years before the light was decommissioned. A typical case was Mary Terry, who became keeper at Escanaba, Michigan’s Sand Point light after her husband died of tuberculosis. As with Georgia Stebbins, it was possible for Mary Terry to demonstrate her competence as a keeper prior to the appointment because she had gradually taken on the job over the course of several years. Similarly, Katherine Marvin was appointed keeper at Squaw Point Lighthouse on Little Bay De Noc when her Civil War veteran husband passed away. In her case and several others, there seems to

¹⁷³ Women made up only 3 percent of lighthouse keepers or assistants. *Biographical and Portrait Record of Kalamazoo, Allegan, and Van Buren Counties, Michigan* (Chicago: Chapman Brothers, 1892), 355-56; Kathy S. Mason, *Women Lighthouse Keepers of Lake Michigan: Heroic Tales of Courage and Resourcefulness* (Lewiston, NY: Edwin Mellen Press, 2012), 30-36; Williams, *A Child of the Sea*, 213-5.

have been a compensatory element in the appointment. She was the mother of ten children with five young ones still at home when her husband died. When the indomitable Mrs. Marvin remarried six years, later she resigned her lighthouse job. All of these women who became light keepers underwent the same three month probationary trial period required of their male counterparts, and passed a qualifying inspection before receiving their job.¹⁷⁴

Having an official assistant keeper on duty at most light stations became more common in the Civil War era and continued until lighthouses were automated. Several factors made it necessary for the Lighthouse Board to take on this added personnel expense. The physical task of maintaining a lighthouse became more arduous as the equipment and design of the structures was upgraded. Under the regime of Stephen Pleasonton, few lighthouses were taller than thirty feet. This seriously reduced their effectiveness. Under the Lighthouse Board, towers, particularly for coastal lights, became taller. This made tasks such as checking on the light during the night, which sometimes had to be done every four hours and hauling fuel up to the lamps more difficult. The Fresnel lenses were very expensive and most were imported from France. Typical lenses on the Great Lakes were the second-order and the third-order which cost \$4,400 and \$1,860 respectively. Hence great attention was paid to the maintenance of these intricate glass devices. Cleaning was a daily task as was hooding the lens to protect its panels from sunlight. For large second- or third-order lenses this was a time-consuming task because of their size and the work could take four to five hours. As the number of lighthouses and navigational aids increased, it was also necessary to alter their beams so sailors out on the lake could differentiate one light from the next. Hence some lights were given a red or green light and many were equipped with a flash rather than a steady beam. Flashes were facilitated after the Fresnel lens had been adopted. The effect was achieved by mounting the lens on a large clockwork mechanism that rotated it in such a way as to systematically interrupt the beam of light. Various types of rotation devices were employed over time. All of these required the vigilance of the keepers to stay in operation. Some rotation mechanisms needed to be wound like a clock every two hours, others every four hours. The best of the later rotation systems needed to be wound every eight hours. Every time winding was necessary someone had to climb to the top of the tower to do so. This could be hard work as the clock mechanisms employed heavy lead weights suspended by cables and hanging down into the tower. Winding the clock for the rotation to continue required cranking the lead weights back up to the top of the tower.¹⁷⁵

Another post-Civil War addition to most light stations was the fog signal. Going back to colonial days, sound had been used at certain coastal lighthouses to help ships locate their position in conditions of poor visibility. This was usually done by means of a cannon that fired a blank charge. The gun would fire in response to an audible signal, usually a cannon shot, from an approaching ship. Bells were also sometimes used and many Great Lakes lighthouses had brass fog bells. As part of

¹⁷⁴ Kathy S. Mason, *Women Lighthouse Keepers of Lake Michigan*, 1-10.

¹⁷⁵ Thomas Tag, "The Clock Without Hands," *Keeper's Log* (Spring 2008), 28-35.

their effort to upgrade U.S. navigational aids, the Lighthouse Board in 1855 began to experiment with steam whistles. The whistles made a very distinct sound, but since whistles were the way steamboats communicated with each other, a lighthouse signal was sometimes confused with an on-coming vessel. The first steam whistles came to the Great Lakes in 1875 when one was installed at South Manitou Island. A small wood frame structure was built to house the coal- or wood- fired boiler, and a second assistant keeper was retained to handle the extra duty. In the decade that followed fog signals were installed all across the inland seas.¹⁷⁶

During the 1860s a new type of navigational aid was added to the system of lights and buoys on the inland seas. The first range lights deployed on the Great Lakes sprang from the practical experience of Dewitt Brawn, the son of the light keeper at Saginaw, Michigan. Brawn delighted in taking a small boat out into the bay, and in navigating, he noted the utility of lining up prominent objects on shore to keep his course steady. When not on the bay, he assisted his father, a partial invalid, in the operation of the lighthouse that marked the entrance to the Saginaw River. He understood his observation could be of value to navigation because each morning he would awake to find one or more schooners anchored off the river mouth. The lighthouse had during the night helped to guide them to the river mouth, but they dared not enter the river in darkness. This caused a regrettable delay in reaching the busy sawmills of Bay City. Sometime around 1865 young Brawn proposed erecting two wooden towers from which he could hoist a lantern. The towers would be lined up exactly with one another. The first tower would be shorter than the second taller tower which was set back a considerable distance. The helmsmen of an approaching ship could enter the river with confidence when he lined the first light with the second. Subscriptions were collected from the lumber ships that frequented Bay City, and the range lights were installed with young Brawn lighting the lanterns every evening. In 1876 the Lighthouse Board replaced Brawn's entrepreneurial venture by erecting a thirty-four-foot tower with a sixth-order Fresnel Lens atop a rock crib near the river mouth. Farther back a new lighthouse with a sixty-one-foot tower with a fourth-order Fresnel Lens was placed in alignment. In the late 1860s the range light concept was put in place by the Board at several sites on Lake Superior and Lake Michigan and was soon adopted throughout the service. It was particularly useful on the Great Lakes because of the long piers constructed to keep river-harbors clear of sand. Pier head lights often function as the first of two sets of range lights that helped mariners keep the correct course for entering the narrow harbor. Although Brawn has often been credited with having invented the range light concept, the deployment of such lights began in the British Isles in the eighteenth century, where they were known as leading lights.¹⁷⁷

The post-Civil War period was one of considerable experimentation with the fuel used to burn in lighthouse lamps. Sperm whale oil had been the most popular fuel in the ante-bellum period. It had excellent burning characteristics, and at first it was readily available thanks to the United States' large fleet of whaling vessels. Between 1840 and 1855, however, the price of whale oil kept escalating, even-

104 176 Terry Pepper, "South Manitou Lighthouse," *Seeing the Light*, <http://www.terrypepper.com/lights/michigan/southmanitou/southmanitou.htm>, accessed December 2014 ;

177 Ron Bloomfield, *Legendary Locals of Bay City* (Charleston, S.C.: Arcadia Press, 2012), 15; Terry Pepper, "Saginaw River Rear Range Light," *Seeing the Light*, <http://www.terrypepper.com/lights/huron/saginaw/saginaw.htm>, accessed February 2015; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 265, 356.

tually increasing four-fold as the great leviathans were slaughtered in all but the most remote polar waters. Many possible replacements were tested from cabbage seed oil to olive oil. Fortunately, Joseph Henry, one of the nation's leading scientists, was a member of the Lighthouse Board, and his investigations demonstrated that lard worked nearly as well as whale oil and it was widely adopted. With Chicago's mammoth Union Stock Yards located in the heart of the Great Lakes region, lard was very readily and cheaply available. One problem with it, unfortunately, was that in order to burn clean it had first to be heated to a high temperature. Harriet Colfax, the keeper of the Michigan City pier head lighthouse, discovered the drawback of this one storm-tossed night. She heated her oil at the keeper's house, but to reach the beacon she had to row

across a creek and then walk through a dune, and finally brave the wave-washed catwalk out to the tower. By the time she climbed the tower stairs to the watch room, her lard had congealed. Going back and repeating the process at the literal hazard of her life did not make her a fan of the new fuel. She was no doubt relieved when in 1878 the Lighthouse Board ordered the transition to mineral oil.¹⁷⁸

The use of mineral oil or kerosene for lighthouse lamps did not come about without its difficulties. In 1864 a Lake Michigan lighthouse keeper decided to experiment with a kerosene lamp. It worked great for several nights. The flame was brighter than the lard oil, and the household kerosene lamp he deployed did not require that he trim the wicks several times during the night. He was about to congratulate himself one morning on a wonderful innovation when an accident occurred. He tried to extinguish the lamp by blowing down the its glass chimney. This ignited an explosion that scattered



Figure 21. Harriet Colfax, longtime lighthouse keeper at Michigan City, Indiana.

¹⁷⁸ Dempster, *Lighthouses of the Great Lakes*, 28; Dennis L. Noble, *Lighthouses & Keepers: The U.S. Lighthouse Service and its Legacy* (Annapolis: Naval Institute Press, 1997), 33-34; Mason, *Women Lighthouse Keepers of Lake Michigan*, 42-43.

burning oil about the deck of the tower and upon the hapless man's clothes. In a panic, he ran down the spiral steps of the tower and struggled to save himself. As he did so, a second much more powerful explosion caused by accumulated petroleum vapors took place that blew the top off the tower. When the incident was sheepishly reported to the Lighthouse Board, it confirmed them in the use of lard oil. In the early 1870s both the French and British launched further experiments with kerosene with good results. The U.S. Board also undertook experimentation at the Staten Island depot and came up with an appropriate lamp design that could burn kerosene safely. This was known as the incandescent oil vapor lamp and it was first deployed in 1877. Conversion of virtually all lighthouses on the Great Lakes followed, although the process was not completed until 1889.¹⁷⁹

The post-Civil War era saw the addition of a new structure at almost all Great Lakes lighthouse stations—the oil house. Lard oil had been a rather safe and stable fuel source while it was employed as the main illumination fuel for lamps. That oil could be stored in the basement of a dwelling or in the lower level of the tower. When kerosene was gradually adopted, lighthouses got a much brighter, cleaner source of fuel but one that was much more volatile. To store it under a dwelling or in the tower was to risk a disastrous explosion or fire. Hence, small oil houses were constructed by the Lighthouse Board at each station. Erected some distance from the dwelling and tower, the oil house followed a standard plan developed by the Board and were usually built of brick or stone. Lighthouse tenders kept the stations supplied with the fuel, which arrived in large wooden casks. Periodically, the keeper would visit the oil house and carefully dole into a brass funnel can several gallons of kerosene and then use the can to refill the lamp. They were vigilant for any sign of a leak or spillage because of the danger of fire.¹⁸⁰

The use of kerosene also brought another change to lighthouses, one that made the keeper's job easier. In 1901 the Englishman Arthur Kitson invented the valorized burner. After some modifications by Trinity House, the English lighthouse authority, the device was installed in most lighthouses throughout Europe and the United States. Kitson's burner replaced the need for wicks and the tiresome task of trimming the wicks to reduce smoking from the lamp. The invention placed the kerosene under pressure causing it to vaporize, mixing with the air. It burned in an incandescent gauze mantle. Similar to camp lanterns used to this day, the new burner allowed for a light as much as six times brighter than the old oil wick lights.

The increased complexity of operating a light by the mid-to late-nineteenth century was reflected in the light's immediate landscape. The concept of such a "light station" came into being after 1852, with the administration of aids to navigation by the Lighthouse Board.¹⁸¹ As the operation of lights

179 United States Lighthouse Board, *Annual Report of the Light-House Board of the United States to the Secretary of the Treasury for the Year 1875* (Washington, D.C.: Government Printing Office, 1875), 99-105; Noble, *Lighthouse and Keepers*, 33-35.

180 Jim Claflin, "Collecting Lighthouse Antiques," *Lighthouse Digest* (July 1998), <http://www.lighthousedigest.com/Digest/StoryPage.cfm?StoryKey=2855>, accessed December 2014.

181 In 1915, the United States Lighthouse Bureau (Service) would regard lighthouses as stations where resident keepers were employed. Clifford, *Inventory of Historic Light Stations*, p.30, citing Robert de Gast, *The Lighthouses of the Chesapeake* (Baltimore and London: The Johns Hopkins University Press, 1973), p.viii, and *United States Lighthouse Service 1915* (Government Printing Office, Washington, D.C., 1916), p.18. Clifford provides a detailed description of each resource type within a lighthouse station, on pages 30-37.

became more complex following the introduction of the Fresnel lens, kerosene, and steam-powered fog signals, more personnel were required. Development of the area around a light tower grew to accommodate one or more keepers dwellings, and use-specific structures such as oil storage houses, a fog signal building, a workshop, a cistern or other water collection system, storage buildings, privies, a garden, fencing, and, frequently, animal shelters, boathouses, tramways, docks, and sidewalk systems. For light stations at remote locations, the keepers' self-sufficient lifestyle depended upon this variety of resources.

While a few light stations were designed as cohesive complexes, it was more typical that buildings and structures were added over time in response to need. As a result, the buildings could represent a wide variety of architectural styles popular at the times of their construction, and reflected adaptations to geographical locations and regional tastes. The lighthouse keeper's housing offered the greatest opportunity for stylistic expression. As the Lighthouse Board did not have a standard design, dwellings built after 1852 were quite diverse in appearance. Climate and site conditions influenced design, as did the availability of materials, as did a law that restricted the expenditure of more than \$6,500 on any dwelling. Fireproof materials were preferred, and ornamentation restrained. Quarters ranged from single to quadruple, depending upon staff size. Housing could be detached, or attached to the tower either via an enclosed passageway, or with direct access to the tower base. After 1913 housing tended to be detached, single houses.¹⁸²

Safe Harbors at Last

Union victory in the Civil War had an immediate and lasting impact on the navigation of the Great Lakes. After 1865 harbor and channel improvements long the subject of political controversy became a normal part of the federal appropriations process. Between 1866 and 1882 harbor improvement bills passed Congress every year with the single exception of 1877. With frequent surpluses in the federal budget there were few financial checks on internal improvement expenditures. When budget minded Presidents made a rare attempt to slow the flow of construction money, as Chester A. Arthur did in 1882 and Grover Cleveland did in 1896, their vetoes were overridden by Congress. Heavy investments in ports and harbors of refuge was a necessity because of the budgetary neglect that occurred under the Pierce and Buchanan administrations and which had by necessity continued during the struggle to save the Union. In 1863 an Army Corps engineer assigned to the lakes complained that virtually all harbors improved in the ante-bellum period were "more or less dilapidated....we have had eleven years of a deterioration without any means of remedy whatever." Congress approved \$250,000 in 1864, which before the war would have been a cause of celebration, but was now seen as only a stop-gap measure. During the lean years, lake ports did not simply languish, rather they funded dredging and breakwater repairs through a variety of local means, from subscriptions, to local taxes, to state grants. In 1864 Muskegon, Michigan, merchants, lacking the equipment to dredge their harbor, paid

¹⁸² Clifford, *Inventory of Historic Light Stations*, p.30-32.



Figure 22. *St. Clair Flats Ship Canal, c.1910.*

a steamer captain to literally bore his way into the port by running his vessel backward and having the propeller excavate a narrow channel. Such makeshift measures ended and a new era of federal support finally dawned in 1866.¹⁸³

The single most important navigational improvement needed was to clear a broad, deep passage through the St. Clair Flats, the marshy mouth of the St. Clair River that connected Lakes Huron and Erie by way of the Detroit River. Colonel Jefferson Cram of the Army Corps of Engineers contended that “very few channels of the world present such a constant stream of passing vessels...The number of tugs, steamers, propellers, scows, barges, sloops and schooners that passed the St. Clair Flats between April 1 and December 14, 1865, was 22,274, and the number of timber rafts, 90.” It was not unusual during the height of the navigation season for there to be as many as one-hundred vessels meandering their way through the shallow channel. Often they would be backed up for days when a grounded vessel blocked their passage. There had been preliminary attempts to create a clear channel between 1852 and 1858 using funds privately raised by the shipping industry when Congress balked at funding the work. James Buchanan’s veto of a St. Clair appropriation had been the last shriek of anti-federalism before the Civil War. In 1866 Army engineers were given a strong appropriation and instructed to plan a lasting solution. Their plan was basically to build a canal through the marsh. At the cost of \$480,000, a one-and-one-half mile channel three-hundred feet wide was cut through the St. Clair Flats drastically shortening the time and difficulty for ships passing between the lakes. It was not,

¹⁸³ Ralph Gordon Plumb, “History of Navigation on the Great Lakes,” *Hearings of the Commerce of the Great Lakes, Committee on Railways and Canals*, (Washington, DC: Government Printing Office, 1911), p.36-39; Elizabeth Sherman, *Beyond the Windswept Dunes: The Story of Maritime Muskegon* (Detroit: Wayne State University Press, 2003), 24.

however, a lasting solution. The Flats was a reoccurring problem in part because the water levels in the Great Lakes fluctuated, sometimes wildly from year to year, and because over time the size of vessels using the waterway increased.¹⁸⁴

Lake Michigan harbors were the prime beneficiaries of the post-war federal largesse. During the Civil War Milwaukee shipped 15 million bushels of wheat per year in addition to millions of dollars' worth of manufactured products. The harbor developed in 1852 under the last Whig administration needed new work to increase its depth from twelve feet to eighteen. Just a few miles south, the town of Racine, Wisconsin, had grown during the war to ten-thousand people, and its harbor served 574 ships annually. While wheat was their principal cargo, the town, like Milwaukee and Chicago, had begun to move into manufacturing as well. By the 1870s Racine was producing more than a thousand threshing machines annually. Federal appropriations immediately after the war increased the harbor's depth to sixteen feet and contributed to this growth. Sheboygan, Wisconsin, used city and county funds to build its first harbor, and by the end of the Civil War better than a thousand ships visited the port each year exporting wheat and bricks. Consistent federal support for improvements in the 1870s increased the port's depth to nineteen feet. Kenosha, Manitowoc, Kewaunee, Port Washington, and Menominee on the Wisconsin shore also blossomed under federal appropriations. On the eastern side of the lake, the lumber port of Manistee had on its own erected a crude set of piers to make a five-foot channel some ships could pass over. In 1867 Congress came to their rescue and built a proper harbor and erected a lighthouse to guide ships into it. In 1874 the port was visited by 3,488 vessels in a single year.¹⁸⁵

Before the Civil War, Lake Superior had been the least developed of the inland seas for navigation purposes. The expansion of the copper and iron mining industries under the stimulus of war necessitated aggressive action in the wake of Appomattox. Marquette, Michigan, was the most important iron ore port on the lake. In 1866 the government funded a new lighthouse for the harbor and began work on an extensive breakwater system that included an additional breakwater beacon. In 1867 Ontonagon, Michigan, was given a new system of piers and the inner harbor was dredged to allow the passage of ore and lumber ships. By the end of the Civil War, the copper country of the Keweenaw Peninsula supplied 97 percent of the nation's supply of the ore that was indispensable for the manufacture of all brass implements. The richest mine in the district—the Calumet and Hecla—was discovered in 1865, and its opening greatly accelerated production. By 1874 northern Michigan mines were producing and Great Lakes schooners were transporting 34 million pounds annually. For years the profitability of the mines had been hurt by the cost of shipping the ore overland or by small boats to the shore of Lake Superior. In 1861 the copper men funded the dredging of the Portage River from its Lake Superior mouth to Portage Lake, an inland body of water near the richest mines. They had bigger

184 John W. Larson, *Essays on: A History of the Detroit District, Army Corps of Engineers* (Detroit: U.S. Army Corps of Engineers, 1981), 74-77.

185 Larson, *Those Army Engineers*, 133-51; Terry Pepper, "Manistee Pierhead Light," *Seeing the Light*, <http://terrypepper.com/lights/michigan/manisteepier/manisteepier.htm>, accessed, December 2014.

dreams, and when the Republicans took over Congress, the mine owners secured a 200,000- acre land grant from the federal government to build a canal north from Portage Lake to Lake Superior. This would create a waterway through the heart of the Keweenaw Peninsula. Work was begun in 1868, but it did not proceed well and the company awarded the project by the State of Michigan faced bankruptcy. Congress was persuaded to come to the rescue and offer an additional 200,000-acre land grant to reanimate the project. The twenty-one mile waterway was completed in 1873.¹⁸⁶

The legal basis for aggressive federal support of Great Lakes navigation improvements was strengthened in 1870 when the United States Supreme Court ruled that not only did the Great Lakes have the same status as “high seas,” but that the navigable streams and rivers flowing into the lakes were also under federal jurisdiction. The ruling stemmed from an 1868 case involving a steamer operating on Michigan’s Grand River, whose owners claimed they need not abide by federal navigation regulations. The Court ruled that since the Grand River flowed into Lake Michigan and any traffic on the river might continue on to other states or nations that waterway was clearly under direct control of the Congress and the national government’s right to manage commerce “among the several states.” It logically followed that Congress had the right, indeed, the responsibility to undertake improvements to navigation not only on the Great Lakes but their connecting waterways.¹⁸⁷

Among the initiatives that followed this ruling was the construction of harbors of refuge along the shore of the lakes. Previously, existing lakeshore towns had to scrap, beg, and scramble for harbor funds. Beginning in the 1870s not only were such communities given federally funded navigational improvements, but government actively sought out other sites where harbors needed to be constructed simply for marine safety. The large undeveloped shoreline of Lake Huron was one of the first locations where the new program was implemented. There was no safe harbor along an eighty mile stretch of shore between Port Huron and Saginaw Bay. Yet more than thirty-thousand vessels passed that shore annually. Congress, therefore, authorized the U.S. Army Corps of Engineers to study that coast and locate the best site for a man-made harbor. A location known as Sand Beach (later Harbor Beach) was selected, and Congress committed the hefty appropriation of \$1.5 million. It took until 1885 for the project to be completed, although vessels began to seek its safe harbor as soon as the breakwaters were installed. The crowning touch of the project was the lighting of a brick tower lighthouse at the entrance to the new refuge.¹⁸⁸

The Harbor Beach harbor of refuge was just one of a series of such projects. The Army Corps soon had other projects under way along other isolated stretches of Great Lakes shoreline, such as Grand Marais on Lake Superior. Early attempts to build these harbors relied upon long breakwaters that

186 Terry Pepper, “Marquette Harbor Light,” *Seeing the Light*, <http://terrypepper.com/lights/superior/marquette/marquette.htm>, accessed December 2014 ; Report on the River and Harbor Bill by the Committee on Commerce, River and Harbor Bill, United States Senate, 61st Congress, 2nd Session, Report No.527 (Washington, D.C.: Government Printing Office, 1910), 525 ; Sarah Harvey, *Jubilee Annals of the Lake Superior Ship Canal: The World’s Greatest Mechanical Waterway* (Cleveland: J.B. Savage Company, 1906), 19-21.

187 *The Daniel Ball*, 77 U.S. 557 (1870), <https://supreme.justia.com/cases/federal/us/77/557/case.html>, accessed October 2015.

110 188 “Small Towns and the Army Corps of Engineers” *The Evolution of the Region*, *National Archives at Chicago Bulletin* (August 2015): 1-8.

would create a basin of calm water even in the face of lake gales. At first these structures were built by sinking wood cribs loaded with stone rubble, but winter storms and ice shortly took their toll, particularly on the upper part of the structure that was exposed to the air. Concrete construction became the preferred medium of building breakwaters after the successful use of that material at Buffalo harbor in 1889. The new concrete breakwaters for harbors of refuge required navigational aids to mark the entrance for ships. Usually these were cast-iron and later steel structures. A skeletal tower about thirty-feet high supported by four steel beam legs was typical, although busier harbors often received more elaborate designs, such as the octagonal steel tower that was lit in 1920 at the entrance to the Keweenaw Waterway or the north Duluth breakwater light. These lights were often difficult to reach and were among the first to be automated in the 1910s.¹⁸⁹

The major ports of the Great Lakes, such as Buffalo whose industries absorbed the cargoes of iron ore and the rivers of grain, all received major make-overs in the wake of the Civil War. The core of these ports was a river or a stream, the Buffalo River and the Chicago River in the case of those cities, the Cuyahoga in the case of Cleveland. Even with constant dredging of slips to create additional dockage, these narrow waterways could not contain all the shipping bound for their ports. Cleveland, for example, which originally had built its trade through wheat and corn after the Civil War became a center for iron- and steel-making as well as oil production. By 1870 there were fourteen rolling mills in the city, and the harbor was handling the delivery of 500,000 tons of iron ore annually. Supported by generous Congressional appropriations, the U.S. Army Corps of Engineers developed outer harbors for each of these cities. A network of breakwaters were positioned several hundred yards out from the river harbor creating a partly sheltered anchorage for ships waiting for dockage space or awaiting new cargoes. The Buffalo outer harbor eventually entailed a series of breakwaters extending more than four miles. Such was the tenor of the times that appropriations of a million dollars for the improvement of a single Great Lakes port sailed through Congress like a scudding schooner with a following breeze. The consequences of the Civil War were palpable from Lake Ontario to Superior's far shore.¹⁹⁰

Canadian Harbor Improvements

The improvements in navigation on the United States side of the Great Lakes was gradually matched by British North America. The key development was the July 1867 creation of the Dominion of Canada, a confederation of a number of Great Britain's American colonies. Founders of the new nation believed inland seas navigation was so "valuable to our people" as to be "essential to the national well-being." Prior to Confederation harbor improvements had largely been left to municipalities or private companies but the new Dominion government established a vigorous public works program under its central administration. In addition to the dredging and breakwater construction similar

189 Thomas Symons and John Quintus, "A History of Buffalo Harbor: Its Construction and Improvement in the Nineteenth Century," *Publications of the Buffalo Historical Society* Vol.5 (1902), 239-85; Leigh Cutler, Duluth Harbor North Breakwater Light, National Register of Historic Places Nomination, Section 7, p.1-2.

190 Mansfield, *History of the Great Lakes*, p.299-300, 561-64; "The Buffalo Breakwater System," *The Engineering Record, Building Record and Sanitary Engineer*, Vol. 47, No.14, (April 1903), 343.

to that undertaken by American army engineers Canadian public works embraced the construction of wharf facilities at nascent ports along the northern shore of the lakes. Prime Minister Sir John A. McDonald's "National Policy" sought to rapidly develop the Canadian economy through internal improvements and tariffs. This policy which was in place for more than twenty years and its emphasis on public works stemmed from a desire to bind the diverse parts of the new Confederation together. It was driven by the fear that if they did not the new dominion would fall to the aggressive expansion of their American neighbors. The core region of the new Canada would be along the Great Lakes axis between Montreal and Windsor, but for the nation to survive on a transcontinental basis transportation from east to west had to be improved. A Dominion Board of Lights ensured that the northern margin of the lakes would be properly marked. Just between 1867 and 1871 ninety-three new lighthouses were built with forty-three more in planning. By the beginning of the twentieth century this number had grown to 220 light stations and three lightships.¹⁹¹

112 191 Plumb, "History of Navigation on the Great Lakes," p.60-61, 65; Babaian, *Setting Course: A History of Navigation in Canada*, p. 44-46.

CHAPTER FIVE

Era of Expansion

1880-1910

Summer 1893/Spring 1894

In 1893 the world came to the shores of Lake Michigan, or at least 21 million people. That year the equivalent of one in four Americans braved a nation-wide depression and attended the World's Columbian Exhibition. The Chicago world's fair was intended to honor the four-hundred years of "progress" that occurred since Christopher Columbus bumped into the New World. The glittering White City of classical revival temples built as odes to industry and science, showed off the latest accomplishments in technology's growing mastery over nature. Anxious to demonstrate the strides the United States had made in improving navigational safety, the Lighthouse Board proposed a major exhibit to be housed under the towering dome of the ornate Government Building. Unfortunately, the Secretary of the Treasury, in view of the hard economic times, significantly scaled back their budget. Just as galling, three French companies exhibited improved lighthouse illumination systems at Chicago, reinforcing the supremacy of the French Government in a navigational aid technology. The U.S. Board, in what one observer dubbed "a brilliant display," was able to show-off a new hyper-radiant lens. It was larger and more expensive than the Fresnel lens, and it greatly impressed fair goers, but it never would be a practical replacement for the French design. Also on display was a model of Orlando Poe's still impressive Spectacle Reef lighthouse. On the banks of the fair's lagoon the Board also erected a new steel skeleton light tower. Visitors could ascend its spiral staircase and were rewarded with a stunning panorama of the fair-grounds, which made the exhibit among the most-frequented attractions.¹⁹²

The Lighthouse Board had reason to be proud of their accomplishments. In the four decades that followed, their takeover of responsibility for navigational aids they had modernized and expanded the American system of lighthouses to the largest in the world. They managed more than three-thousand major lights. Those major lights and ten-thousand other navigation markers together with the charts, harbor, and channel improvements of the U.S. Army Corps of Engineers had transformed

¹⁹² The often cited figure of one in four Americans visiting the world's fair is actually a projection based on the total attendance of 27 million people, roughly 25 percent of the United States population. Donald L. Miller estimates that up to 14 million foreign visitors attended the fair, *City of the Century: The Epic of Chicago and the Making of America* (New York: Simon & Schuster, 1996), 488 Timothy Harrison, "Lighthouses at the 1893 World's Columbian Exposition," *Lighthouse Digest*, (September 2008), <http://www.lighthousedigest.com/Digest/StoryPage.cfm?StoryKey=2893> ; Barrett, J.T. Electricity at the Columbian Exposition: An Account of the Exhibits. (Chicago R.R. Donnelly, 1894), 68; Theresa Levitt, *A Short Bright Flash: Augustin Fresnel and the Birth of the Modern Lighthouse* (New York: W.W. Norton, 2013), 224; Rossiter Johnson, editor, *A History of the World's Columbian Exposition Held in Chicago in 1893*, Vol. 3, (New York: D. Appleton & Company, 1898), 493.

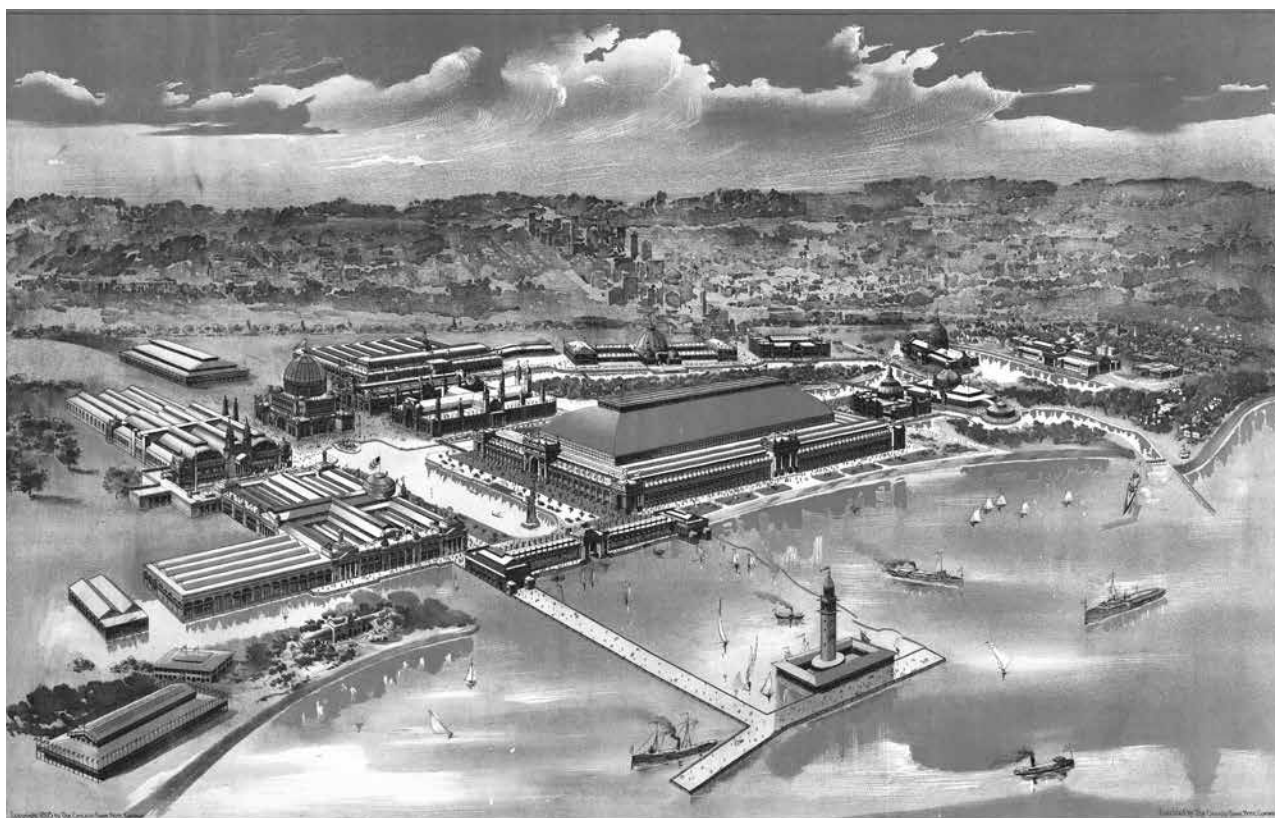


Figure 23. *World's Columbian Exposition, 1893.*

the Great Lakes shoreline from a wilderness waterway to an artery of industrial commerce. From atop their World's Fair lighthouse, visitors looked out over a city that had risen from the swampy prairie to become the nation's second most populous metropolis and its busiest port. The Board's pride in seeking recognition for their accomplishment was understandable. So too was the hubris of the fair organizers, who so stunningly celebrated the victory of civilization over wilderness and technology over nature. In the summer of 1893, the shimmering White City, aglow in the night with the illumination of over 100,000 incandescent lights, was a promise of a well-ordered, safe, bright future.¹⁹³

In less than a half-century, electricity, in the form of radio waves as well as illumination, would indeed transform navigation and navigational aids, but in the 1890s nature could still respond to human hubris with nemesis. Seven months after the World's Columbian Exposition closed, nature put on an exposition of her own when a massive spring storm swept the Great Lakes region. On May 16, 1894, unusually warm weather, with temperatures in the high eighties, suddenly was confronted with a cold front arriving from the west. Tornadoes descended on the heartland. In Ohio, Illinois, and Michigan towns and farms were ripped apart. For the next three days, a powerful gale with winds in excess of fifty miles an hour ripped the surface of Lakes Huron and Michigan. The storm was what some of the old-time sailors called a "schooner eater." Most of the large modern steamers caught in the

gale suffered severe damage but were able to fight their way into harbors of refuge. Less fortunate were the sailing ships. Across the northern reaches of the lake, schooners were driven ashore. At Milwaukee two schooners failed to make the harbor and were sunk in the shallows. Their crews climbed up the wind-lashed rigging. Rescue attempts managed to reach only one of the five sailors of the *M.J. Cummings*, and the others were either swept away or died frozen to the ratlines.¹⁹⁴

It was in Chicago, where the summer before millions from around the world had gathered to celebrate American progress, that the spring gale enacted its most awful drama. Scores of vessels had been driven by the fierce wind to the ports at the south end of the lake. Here the waves were highest as the storm had fully three-hundred miles of open water to build its strength, yet here also the vessels that had run before the gale suddenly ran out of room. Breakwaters built in the 1880s that created an outer harbor provided some protection for those who could chance the passage through the narrow opening. Others cast their anchors outside the refuge and hoped their lines would hold until the storm abated. For most, it was a forlorn hope. One by one eight schooners lost their anchorage or were smashed by other ships careening out of control. As many as 100,000 people gathered on the lakeshore as mariners fought to save their vessels and then their own lives as ship after ship was smashed against breakwaters or were washed over them by towering waves. Life-saving crews and makeshift rescue efforts by police and citizens pulled many storm-tossed sailors to safety. By day's end, however, the spring gale of '94 had severely damaged or sunk thirty-five ships with the loss of twenty-seven lives. Civilization could celebrate the conquest of the New World in splendid fairs, but the Great Lakes remained unpredictable, dangerous, and wild.¹⁹⁵

Storm Warriors: The U.S. Life-Saving Service

The 1890s were a storm-tossed decade on the Great Lakes. Between 1891 and 1895, an average of fifty-eight ships were lost annually on the lakes. Many of these were older sailing vessels nearing the end of their useful careers. The loss of life in these incidents was reduced because of the establishment of life-saving stations all along the shores of the inland seas. In the United States the federal government began its formal involvement in life-saving in 1848 when it established a series of volunteer manned stations along the Atlantic coast. Boat stations came to the Great Lakes in 1854 with Lake Michigan receiving the most with twenty-three positioned along its margins. At best the stations were simply a boathouse with a government owned lifeboat, in some cases simply the boat exposed to the elements. In Canada the same haphazard approach was initially followed. In the 1870s the United States moved past this volunteer nucleus and developed a network of fully manned and equipped stations under the Treasury Department that was designated the United States Life-Saving Service. Up to this time, life-saving had been restricted to the *ad hoc* heroism of brave bystanders to a wreck or the intervention of lighthouse keepers. Following Congressional action in June of 1874, a series of life-saving stations

¹⁹⁴ David Swayze, "The Great Spring Gale of 1894," *Inland Seas*, Vol. 48, No.2, (Summer 1992), 99-112.

¹⁹⁵ Swayze, "Great Spring Gale of 1894," 103-8; *Chicago Tribune*, 19 May 1894.

were established on the Great Lakes. These were initially divided between actual manned stations and other sites where equipment and lifeboats were positioned for volunteer crews.¹⁹⁶

Under the new scheme, the nation's coastline was divided into a series of life-saving districts. The Great Lakes were awarded the Ninth (Lake Ontario-Erie), the Tenth (Lake Huron-Superior), and the Eleventh (Lake Michigan). Life-saving in the Lake Erie-Lake Ontario district was put under the direction of veteran schooner master David P. Dobbins. He had already won a reputation for heroism through his rescue of distressed mariners in the 1850s and 1860s. In 1876 he set up stations near the major harbors including Oswego, Buffalo, Erie, and Cleveland. Key to the successful management of this and other life-saving districts was the appointment of the right man as keeper. Dobbins's experience as a mariner helped him recognize the type of individual whose steady attention to detail, self-discipline, combined with a cool head and courage, would allow them to excel at the post. For the Fairport station on Lake Erie he selected George F. Babcock, an experienced schoonerman and an assistant lighthouse keeper. For twenty-two years he was in charge of the Fairport station which was responsible for saving the lives of more than 300 people. Charles C. Goodwin of the Cleveland station was a State of Maine man and a Civil War veteran. He had been engaged before the mast since the age of fourteen with long experience at the helm of Great Lakes schooners. His numerous rescues of distressed vessels won him and every member of his crew the Gold Life-Saving Medal First Class.¹⁹⁷

On Lake Superior life-saving stations were established mainly along remote isolated stretches of coastline where sailors who survived a shipwreck might easily die of exposure before reaching aid. On Lake Huron, however, all of the first life-saving stations were erected near existing lighthouses, some of which like Thunder Bay Island, were themselves fairly remote. In the Eleventh District that covered Lake Michigan nearly all the stations were at port cities. The exceptions were two stations at the north and south ends (North Manitou Island and Point Betsie) of the busy Manitou Passage the doorway through which most Lake Michigan traffic entered or exited the lake. For the crew that worked these stations between April and the beginning of December location greatly impacted the nature of their work experience. Crews at isolated stations operated at greater peril with little support other than their good judgement, strong arms, and stout boats. Even nightly beach patrols were riskier on lonely, wild shores. Crews based at major ports such as Buffalo or Chicago encountered much more action but could count on backup from tugboats. They became accustomed to crowds of citizens watching and cheering on their surf boat drills. Their sweethearts, wives, and children were never far away. Leave from the station could be enjoyed in lively urban communities while their mates at many Lake Superior or Lake Huron stations literally had nowhere to go.¹⁹⁸

196 Mansfield, *History of the Great Lakes*, 778; Dennis L. Noble, *A Legacy: The United States Life-Saving Service* (Washington, D.C.: United States Coast Guard Office of Historian, 1976), 4-6; Irving King, *The Coast Guard Expands, 1865-1915: New Roles, New Frontiers* (Annapolis: Naval Institute Press, 1996) 193-204.

197 O'Brien, *Guardians of the Eighth Sea*, 34-36; Mansfield, *History of the Great Lakes*, Volume II (Chicago: J.H. Beers, 1899), 702.

198 J.H. Rogers, Assistant Inspector to Harrison Miller, Keeper of Point Betsie Station, 11 May 1889, Point Betsie Life-Saving Station Records, 1888-1931, Box 1, Sleeping Bear National Lakeshore, Empire, Michigan; O'Brien, *Guardians of the Eighth Sea*, 36-38; Marblehead Life-Saving Station Journal, November, 1877, Historical Collections of the Great Lakes, Bowling Green State University.

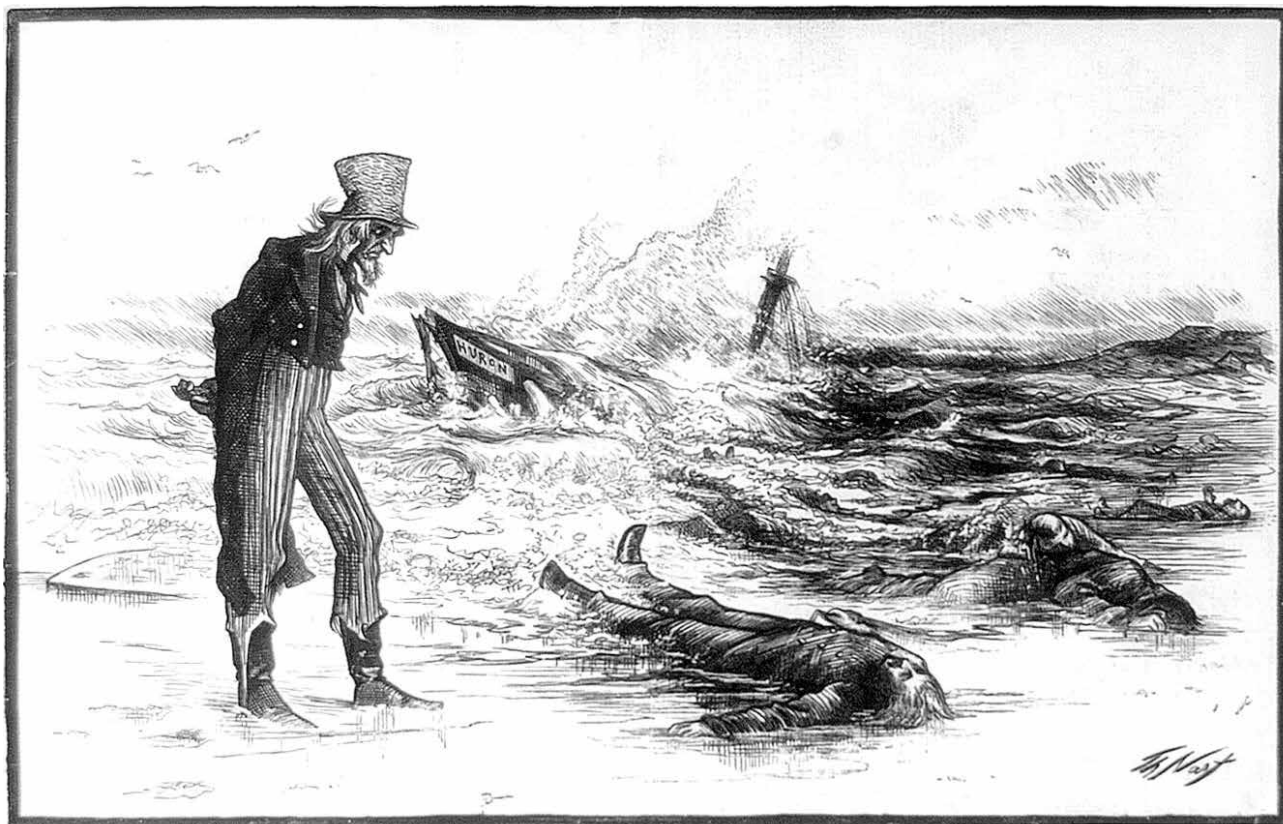


Figure 24. Harper's Weekly cartoon shames U.S. Government into doing more to save mariners lives. Caption reads: Death on economy. U.S. "I suppose I must spend a little on life-saving service, life-boat stations, life-boats, surf-boats, etc.; but it is too bad to be obliged to waste so much money."

In Canada a professionalized life-saving service did not emerge until 1882 when the first manned station was established at Cobourg on Lake Ontario. The next year four more stations followed with the most important being at the busy harbor of Toronto. Thereafter the number of stations grew to include Lakes Erie and Huron. A reciprocity agreement was developed with the United States Life-Saving Service so that each nation would come to the aid of distressed vessels regardless of the flag that they flew.¹⁹⁹

The actual work of life-saving took three forms. Nightly beach patrols kept a lookout for vessels in distress. The patrollers also kept a lookout for ships heading toward shoals or reefs and they would ignite Coston flares to warn them off. If a ship was pushed close to the shore and grounded in the surf the life savers had an elaborate set of beach apparatus to deploy to extract the crew from the stranded vessel. Even within a hundred yards of shore sailors were in great danger. Heavy surf and rip currents, not to mention the icy spring and autumn water temperatures usually precluded any attempt to swim for shore. If the wreck was within 600 yards of shore the life savers would set up a small smooth bore cannon known as a Lyle Gun. Invented by West Point graduate David A. Lyle the gun shot a light weight line from the beach to the distressed ship. That line could then be used to pull a stout rope

¹⁹⁹ Plumb, "History of Navigation on the Great Lakes," p.67.

out to the wreck. From this line a breeches buoy could be attached above the waves and one by one crew members could be pulled safely to shore. All these tools were stored on a broad-wheeled beach cart that rescuers could maneuver from their station to the site of the wreck. The final and most dangerous duty of the life savers was when a beleaguered ship was far off the shore. Upon spotting a distress signal or receiving a telegraph from a lighthouse keeper the crew of the station would use a flare to signal the ship and then launch a life boat and attempt to row out to the sinking vessel. It took courage to launch a small life boat, often at night, in cold, heavy seas that had already floundered a much larger craft. It also took great endurance for six oarsmen to force a two- to four-ton wooden boat through storm-tossed waters. It could take hours of effort to reach a ship and great strength and skill to keep a heaving wreck from smashing the lifeboat when they tried to bring the crew aboard. In 1878 David P. Dobbins, the superintendent of the Erie-Ontario District, designed a self-bailing, self-righting lifeboat that became the preferred vessel for dangerous rescues. With a capacity for thirty people, air-tight compartments in the bow and stern, cork ballast, and waist port scuppers together with a stout white oak frame all ensured that it quickly became a favorite tool for life-savers throughout the Great Lakes.²⁰⁰

By 1893 there were forty-seven life-saving stations along the shores of the inland seas. The men who staffed the stations tended to be local to the area of the station. The service was seasonal and surf men were paid between forty-five and sixty-five dollars a month from April until December. They usually had to find other work during the winter season. During the shipping season, life at a station was a dull monotony punctuated by occasions of high drama. A regular schedule helped to keep idle hands busy and the station at a state of readiness. Keepers drilled their men maneuvering and deploying the beach apparatus every Monday and Thursday. They were expected to have the Lyle Gun fired within five minutes of reaching a hypothetical wreck location. District superintendents often encouraged competitions between stations for the fastest times, and it is reported that some well-drilled crews could deploy their beach cart and fire their rescue gun within two minutes. On Tuesdays the crews conducted boat drills with both their small light surf boat and their larger Dobbins boat. In fair weather, part of the drill was to deliberately capsize the boat and quickly re-right it. For urban stations this became a crowd-pleasing spectacle. Expert crews could spin a boat over so fast that the coxson at the boat's stern would barely get his ankles wet. Wednesdays were dedicated to practice with signal flags. These internationally known ensigns allowed ships to indicate from afar if they were disabled and in need of assistance and for stations to acknowledge and convey instructions. The most common signal spotted by life-saving lookouts, however, was the U.S. flag displayed upside down as a sign of distress.²⁰¹

The fortitude and tragedy that marked the infrequent but arduous work of the U.S. Life-Saving

200 Noble, *The United States Life-Saving Service*, 10-13; O'Brien, *Guardians of the Eighth Sea*, 37-39 ; David Porter Dobbins, *The Dobbins Life Boat* (Buffalo: Matthews, Northrup & Company, 1886), .29-36.

201 "Buffalo's U.S. Lifesaving Service 1876 – 1915," *Western New York Heritage*, http://wnyheritagepress.org/photos_week_2009/lifesaving%20_station/lifesaving_station.htm, accessed December 2014.

Service is exemplified by the October 1880 wreck of the *J.H. Hartzel*. The three-masted schooner had left L'Anse in Michigan's Upper Peninsula with a load of iron ore. Rather than risk entering Frankfurt, Michigan's harbor at night, the captain elected to anchor just to the south. It was a cautious and wise move, unfortunately, during the night the weather took a sudden and drastic turn for the worse. Gale force winds ripped her from her anchorage and wrecked the vessel on a sand bar. The battered vessel broke and sank with the crew seeking refuge in the cross-trees of the foremast. Citizens on shore noticed the wreck and signaled to the vessel that the life-savers were on their way. That cheering news was not quite true as it took a lad a ten-mile horseback ride to reach the Point Betsie station. The keeper and crew set out immediately with the cart-mounted beach apparatus. The cart weighed one-thousand pounds, and the route led from dune to country road to pathless forest. By herculean effort and the occasional use of a horse, the crew made the ten mile journey in an astounding but exhausting two hours' time. All the while, the *Hartzel's* captain and crew of six, lashed by frigid water, were gradually being encased in ice. The mast that kept them above the surf creaked and swayed wildly threatening to break with every wave. With no time to lose, the life-savers deployed their Lyle Gun and shot a line to the wreck of the schooner, but as the distressed crew tried to secure it with their benumbed hands, it was fumbled into the breaking waters and it became fouled in the wreckage. A second line made it to the men, but when they tried to pay out the stout double rescue rope, it became twisted in the surf and debris and another hour was spent trying to untangle the lines. Finally, the breeches buoy was secured. It took seventeen minutes to pull the first crew member to safety. He informed the rescuers that among the crew was a woman, the cook, who was very ill and who would not go in the precarious breeches buoy. Hoping to speed the process and safely rescue the woman, station keeper Thomas Matthews order his men to attach a "life car" to the line. This small water-tight vessel was capable of carrying up to six passengers. Several times it was pulled out to the wreck bringing two of the crew to safety. Each time the life car hatch was removed the rescuers expected to find the woman. When the final two men were taken off, they announced the woman had been left for dead in the cross-trees of the wreck. Her body was recovered seventeen days later. For the men of the Point Betsie station and the group of citizen volunteers who aided their long effort, it was a dispiriting end to their labor. They loaded their gear on to the cart and began the ten-mile journey back to the station, which they reached "wearied beyond expression" after nearly twenty-four hours of unceasing effort without food or rest.²⁰²

The ability of the Life-Saving Service to affect a rescue was greatly enhanced due to the ingenuity of Henry Cleary of the Marquette, Michigan, station. Cleary was perhaps the most famous station keeper in the Life-Saving Service. Two years after he became keeper at Marquette he had been selected to head the Life-Saving Service exhibit at the 1893 Columbian Exposition. The exhibit was actually

202 *Annual Report of the Operations of the United States Life-Saving Service For the Fiscal Year Ending June 30, 1881* (Washington, D.C.: Government Printing Office, 1881), 19-36 ; William D. O'Connor, *Heroes of the Storm* (Boston: Houghton-Mifflin, 1904), .92-124; Daniel Koski-Karel, et al, U.S. Government Lifesaving Stations, Houses of Refuge, and pre-1950 U.S. Coast Guard Stations, National Register of Historic Places Multiple Property Documentation Form, 2013, Section E, 9.



Figure 25. Increase Lapham, the Wisconsin scientist behind the creation of Great Lakes marine weather forecasting.

a fully functioning station located on the fair ground's lagoon. So popular were the demonstrations of service techniques and proficiency at the Chicago Fair that Cleary was regularly dispatched to train crews for the many other expositions that followed in the wake of the success of the 1893 fair. These expositions included the 1898 Trans-Mississippi Exposition in Omaha, 1901 Pan-American Exposition in Buffalo, 1903 Louisiana Purchase Exposition in St. Louis, 1907 Jamestown Exposition in Virginia, and the 1909 Alaska-Yukon Exposition in Seattle. In the course of the presentations at expositions Cleary came to know leading politicians and capitalists of the age. The fairs also triggered his imagination and he focused his energy on coming up with a new and improved rescue boat. In 1899

he used his connections to have a spare thirty-four foot lifeboat shipped to Marquette from New Jersey. With the aid of his Number One surf man John Anderson, Cleary placed a twelve-horse power gasoline engine in the boat. Their tests were successful and quickly powered boats with increased horsepower were put in service along the lakes and ocean shores.²⁰³

Life-Saving stations were built in a variety of styles and often reflected contemporary tastes. The Queen Ann style and Shingle style, in particular, reflected popular domestic architectural styles and suited the purpose of the buildings. Queen Anne structures were notable for their protruding towers which made excellent posts for the station's day lookouts. The Chicago Harbor station is an example of the Shingle style while the original Milwaukee and Oswego stations and the existing North Manitou Island station display Queen Ann influences. The Buffalo Harbor station blended the Shingle style and the Queen Ann. Albert B. Bibb, an architect in the service's Office of Construction, created a standard

²⁰³ O'Brien, *Guardians of the Eighth Sea*, 42; Moses Handy, editor, *The Official Directory of the World's Columbian Exposition*, (Chicago: W.B. Gonkey and Company, 1893), 158; Daniel Koski-Karel, *et al*, U.S. Government Lifesaving Stations, Houses of Refuge, and pre-1950 U.S. Coast Guard Stations, National Register of Historic Places Multiple Property Documentation Form, 2013, Section E, p.9.

design in the Shingle style that was popular in the 1890s. Known as the Marquette-type station after the site of the first place it was employed, this design separated the living quarters from the boathouse. The design was utilized thirteen times on the West Coast and on the Great Lakes. The Sleeping Bear Point and South Manitou Island stations were both done according to this plan.²⁰⁴

Origins of Marine Weather Forecasting

The first efforts toward predicting weather along the Great Lakes were made in 1859 by George G. Meade in conjunction with his work leading the Lake Survey. He established nineteen stations where meteorological conditions could be recorded and forwarded to the Survey office in Detroit. The onset of the Civil War and the strain it placed on the U.S. Army disrupted this system just as it was beginning. The person responsible for prompting the government to return to this responsibility was Increase A. Lapham, a remarkable pioneer of American science. Lapham was the son of an engineer who worked on the building of the Erie, Welland, Miami, and other canals that played a key role in opening the Great Lakes frontier. The son worked at his father's side learning both manual skills and engineering. Canal work led to one of his first scientific papers on the geology of Ohio. With his relocation to Milwaukee in 1836 Lapham devoted himself to the study and advancement of Wisconsin. He cooperated with Captain Meade in the study of both lunar tides on the Great Lakes and meteorology. Lapham had long pressed ship owners and mariners on the need to establish a weather reporting system as a way to reduce the loss of vessels to violent storms. After presenting his ideas to one mariner, the fellow rebuffed Lapham by claiming he had: "little time to investigate meteorological papers, and had never been impressed with the opinion that our changeable and fickle climate could be put under any rules by which mariners might be guided with any certainty or much profit."²⁰⁵

When explanations of meteorology failed to win converts, Lapham resorted to something businessmen would understand—dollars and common sense. In 1868 and 1869 he issued a report titled "Disaster on the Lakes" which listed marine losses on the Great Lakes for those years. In 1868 the list included 1,164 vessels damaged (105 of which were sunk), 321 deaths, and \$3.1 million in property damage. In 1869 the total number of vessels damaged was 1,914 (126 of which were sunk), 209 lives lost, and \$4.1 million in financial losses. These figures got the attention of the leaders of the Milwaukee Board of Trade, and he persuaded them to push for the creation of a national weather service. This was done first as a resolution at the 1869 meeting of the National Board of Trade and then as legislation approved by Congress and signed by President Ulysses S. Grant in 1870. Under the law, the U.S. Army Signal Service was given responsibility "to provide for taking meteorological observations at the military stations in the interior of the continent and at other points in the States and Territories...and for giving notice on the northern (Great) lakes and on the seacoast by magnetic telegraph and marine

204 Eugene V. York, *The Architecture of the United States Life-Saving Stations*. (Master of Arts Thesis, Boston University, 1983), 64-70.

205 Gustav J. Person, "Captain George G. Meade and the Lake Survey," *Engineer* (September-December 2010), 43-49; "Sketch of Increase A. Lapham, LLD," *Popular Science Monthly*, Vol.22, (April 1883): 835-40; Rebecca Robbins Raines, *Getting the Message Through: A Branch History of the U.S. Army Signal Corps* (Washington, D.C.: United States Army Center for Military History, 1996), 46.

signals, of the approach and force of storms.” It was thought that “military discipline” would provide for the “promptness, regularity, and accuracy” required. Twenty-four stations were established, most at existing military posts in the west and along the Great Lakes. Lapham coordinated the early reports, and in November 1870, he had the satisfaction of issuing the first marine forecast for the region.²⁰⁶

What the army signal men undertook amounted to synoptic weather observations. They recorded the sky cover, wind velocity, high and low temperatures, and barometer readings. What gave these various readings value was the use of telegraphy to quickly gather data in a central location, and the recognition that in North America weather fronts generally followed a west to east pattern. A system of regular storm warnings was in place by the 1871 shipping season. Major ports received notice from the Army Signal Service when winds twenty-five miles an hour or worse were predicted for their vicinity. Signal service personnel would hoist a red flag with a black square in the middle as a storm warning. At smaller ports, mostly in Michigan and Wisconsin, civilian employees were charged with receiving storm warnings and posting signal flags. Great Lakes forecasting was further enhanced in 1871 when the United States and the Canadian Dominion agreed to share information thereby giving notice of the notorious low pressure systems descending from the Sub-Arctic that brewed up the worst storms on the inland seas. The system soon won the respect of ship owners. A striking example is offered by the results of a storm tracked by Army signal men beginning in Omaha on November 11, 1871. Over the course of the next five days the storm warning flag was raised at eight major ports on the lakes between five and twenty hours before the front hit. Faced with this warning, no vessels left Milwaukee harbor, and most stayed at their moorings in Chicago and Cleveland. Those that did chance the weather returned damaged, one sank with loss of life. On Lake Ontario most vessels stayed in port. Several that left Oswego returned damaged and one was lost in the storm.²⁰⁷

The availability of reliable marine weather forecasts made shipping grain during the dangerous spring and fall seasons more secure. Insurance costs became lower and as a result so too did shipping rates for the long haul from Lake Michigan to Buffalo. The impact marine forecasts had on the safety of Great Lakes navigation can be seen by what happened when the system of reporting was reduced through Congressional budget cuts. In 1882 it was discovered that the disbursing officer for the Signal Service had been embezzling as much as \$60,000 annually from the weather system budget. Congress reacted by reducing the service’s budget for 1883. As a result the number of storm-warning stations was reduced from more than seventy to a mere forty-three. This was followed in 1883 by an immediate and steep increase in the number of shipping losses. One economic historian has estimated that losses that year were 87 percent greater than the year before or the year following when the stations were reopened. Marine weather forecasts ever since have been regarded as one of the most important

206 “Sketch of Increase A. Lapham, LLD,” *Popular Science Monthly*, Vol.22 (April 1883) http://en.wikisource.org/wiki/Popular_Science_Monthly/Volume_22/April_1883/Sketch_of_Increase_Allen_Lapham,_LL.D., accessed January 2015; Erik D. Craft, “An Economic History of Weather Forecasting,” *EH.net* (Economic History Association), <http://eh.net/encyclopedia/an-economic-history-of-weather-forecasting/>, accessed January 2015.

207 Erik D. Craft, “The Value of Weather Information Services for Nineteenth-Century Great Lakes Shipping,” *American Economic Review*, Vol. 88, No. 5, (December 1998), 1059-76; Erik D. Craft, “Early Weather Information, Cost That Can Be Sunk, And the Ensuing Rate of Return,” *Working Paper No. 15*, George J. Stigler Center for the Study of the Economy and the State (Chicago: University of Chicago, Stigler Center, 1996), 12-20.

ingredients in safe navigation.²⁰⁸

The remarkable success of the Army Signal Service in creating and expanding a telegraphic system of weather forecasts was somewhat overshadowed by the negative image created by Captain Henry Howgate, the officer who was convicted of the massive embezzlement of Weather Bureau funds. There was also concern in the Army that the weather forecasting duties had high-jacked the Signal Service from its military orientation, and that in the event of war, its officers and men would be too busy monitoring the clouds to manage military communication. Things came to a head in 1889 when President Benjamin Harrison recommended the transfer of the Weather Bureau to the Department of Agriculture. This brought about a conversion of marine forecasts from a military to a civilian function.²⁰⁹

Changes in Great Lakes Vessels: Of Steam, Steel, and Robber Barons

In the mid to late 1880s there was a dramatic increase in the percentage of the Great Lakes merchant fleet that was powered by steam. In the 1860s and 1870s the overwhelming number of vessels carrying grain east to Buffalo or iron and copper ore south from Lake Superior were sailing ships, most either barks or three-masted schooners. In part, this was because the basic design of Great Lakes steamers had been set in the 1840s and 1850s when passenger traffic was the high value trade on the lakes. As the railroads expanded into the region, however, steamers lost their passengers to trains, which took a more direct route west and one that was relatively safe and available regardless of the season. At the same time, there was an expansion in the amounts of grain, ore, and timber moving east and coal headed west, all of which needed ships to carry them to market. These factors combined to bring about a revolution in both ship traffic and vessel design on the Great Lakes.

The first small sign of things to come was evident as early as 1848 when *Petrel* was launched at Port Huron, Michigan. She was a propeller driven ship 225 feet in overall length and 32 feet in width with her engine located aft to allow a large cargo hold at mid-ship. She was initially built to carry lumber, but that trade was still in its infancy before the Civil War so she went on to carry a wide variety of cargoes. The launching of the *R.J. Hackett* at Cleveland in 1869 was a better merger of technology, ship design, and business plan. This was a steamer designed for the carrying of bulk cargoes with no accommodations for passengers, and while she sprouted three schooner-rigged masts, her principal power source was a steam engine located aft which drove a single powerful propeller. A forward pilot house and cabin kept the mid-ship area available for cargo and began a long tradition of “lakers” having the pilot house in the bow. Large open hatches made it easy to load her with either grain or ore. Put on the iron ore route between Marquette’s iron ore docks and Cleveland’s blast furnaces, the *R.J. Hackett* was such a success that she was given a sister ship, the *Forest City*, in 1871. Numerous other

208 Craft, “Value of Weather Information Services for Nineteenth Century Great Lakes Shipping,” 1065.

209 Gary Grice, editor, “The Beginning of the National Weather Service: The Signal Years (1870-1890),” NOAA National Weather Service, Public Affairs Office, <http://www.nws.noaa.gov/pa/history/signal.php>, accessed January 2015.

vessels copied their design, which became known, somewhat incongruously, as steamer barges.²¹⁰

In 1884 the tonnage of steam-driven vessels, many of which were propellers like the *R.J. Hackett*, was greater than the tonnage of sailing ships on the lakes. Two years later the absolute number of steamers was greater than the number of sailing ships still in service. In 1870 steam ships represented only 39 percent of the new ships launched on the inland seas, yet by 1910 that number had grown to 100 percent. An increasing emphasis on efficiency drove this transition. Navigation on the Great Lakes was a seasonal business. With most traffic halted between December and April, merchants needed to maximize the number of trips that could be made during the shipping season. By the 1890s shipping agents estimated that on account of their greater speed steamers could carry two and a quarter times the cargo in a season than a sailing ship. Steam-powered vessels were particularly desired for trades that required adherence to a schedule. The iron and steel industry required iron ore, coal, and limestone to operate their blast furnaces. A short-fall in the availability on any of these commodities could force the shutdown of a blast furnace with the loss of both production time and increased energy costs. Therefore, steamers pushed schooners out of this trade long before the windjammers lost their place in the grain or lumber trade. The switch from wood to coal as the main fuel for lake steamers also improved their efficiency. Although coal was not readily available in the region until the 1890s, its use instead of wood in firing boilers gave vessels much greater range and did away with the numerous refueling stops of the original steamers.²¹¹

The next big step in ship design was taken by the Globe Iron Works of Cleveland in 1882 when they launched the *Onoko*. At 282 feet in length, she was dubbed the “Queen of the Lakes.” *Onoko* was also one of the first iron-hulled freighters. The design, however, was not popular. Insurance underwriters believed iron hulls were too brittle and vulnerable to major damage when grounding—a frequent danger on the lakes. The Detroit Dry Dock Company developed a compromise between iron and wood hulls when it launched the *Fayette Brown* in 1887. She was what was called a “composite freighter” because her hull was made of an iron frame, oak planking, covered by iron plates. These bulk carriers had the strength to carry large heavy cargoes like iron or copper ore. It was, however, the launching of the *Spokane* in 1886 by the Globe Iron Works that was the true signpost to the future. At 310 feet and 3,400 tons she was the largest vessel to float on the lakes up to that time. Her steel hull had the strength and flexibility to handle either the power of a November gale on Lake Superior or the danger of grounding in the shallow channels at the Soo or Lake St. Clair. Like the *R.J. Hackett*, the *Spokane* sprouted three masts to be used in case of emergency or in favorable wind conditions.²¹²

210 Dina M. Brazzill, “The Missing Link Between Sail and Steam: Steam barges and the Joys of Door County, Wisconsin,” *Research Report No. 19* (Greenville, N.C.: Program in Maritime Studies, East Carolina University, 2007), 28-30; Barry, *Ships of the Great Lakes*, 107-8.

211 Jerome King Laurent, *The Development of Harbors, Waterborne Shipping, and Commerce at Six Wisconsin Ports on Lake Michigan Through 1910*, (Ph.D. Dissertation, Indiana University, 1973), 75-82; Craft, “Value of Weather Information Services for Nineteenth Century Great Lakes Shipping,” 1061.

212 The first iron ship on the Great Lakes and the first iron ship in the United States Navy was the *U.S.S. Michigan* launched in 1844. An iron hulled passenger-package steamer, the *Merchant*, was launched in 1862 at Buffalo but wood remained the dominate material for hulls on the inland seas for another two decades. A year before the launch of the *Onoko* the Detroit Dry Dock Company produced the *Brunswick*, which was basically a copy of the *R.J. Hackett* but with an iron hull. The ship had a short, star-crossed career sinking with loss of life in Lake Erie after only a season of service. For more see, Mark L. Thompson, *Queen of the Lakes* (Detroit: Wayne State University Press, 1994), 31-33.

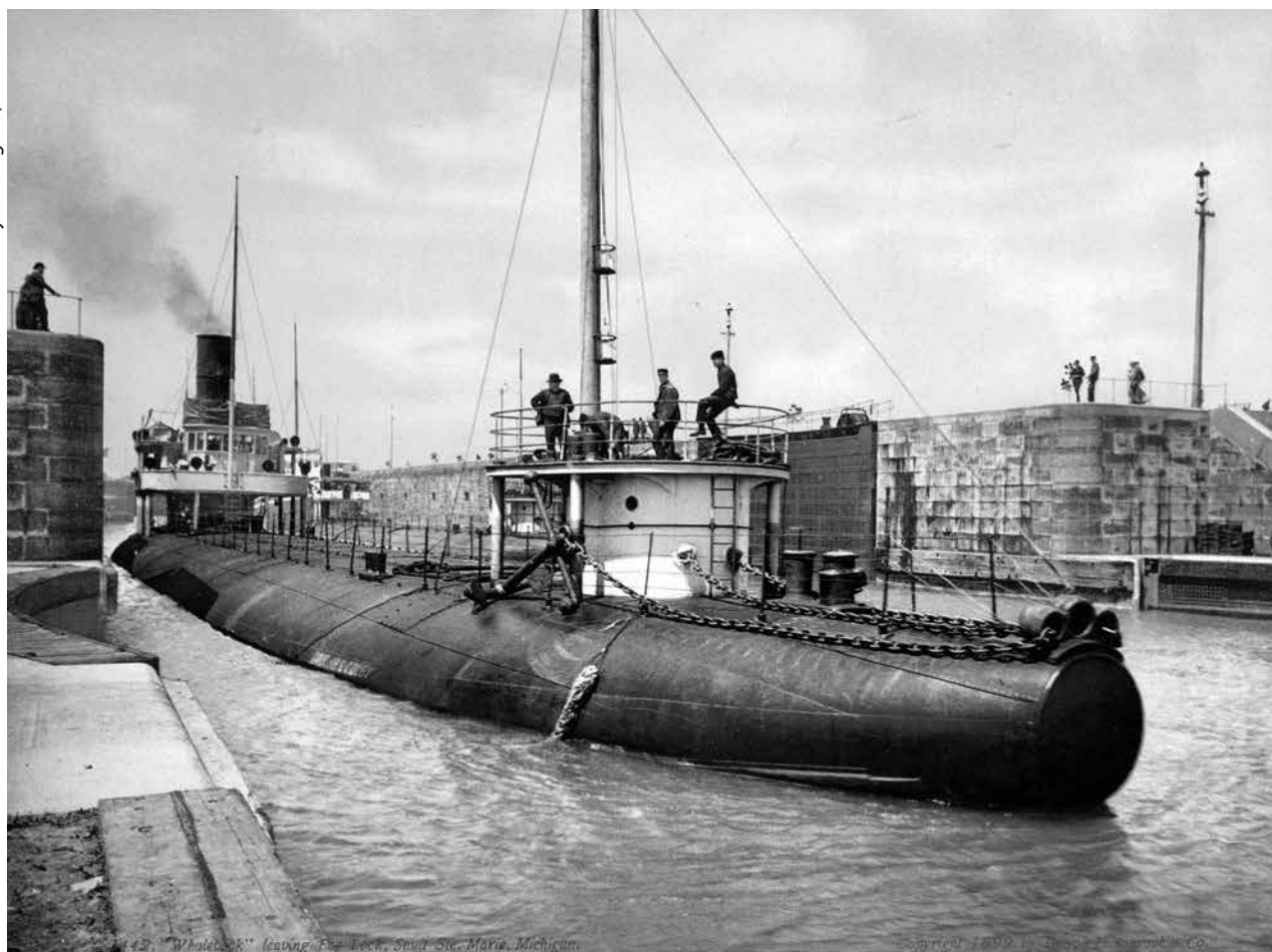


Figure 26. Whaleback steamer in Sault Sainte Marie Lock.

The 1880s and 1890s were a period of expansion and creativity in the lake marine. A trend began that continues into the present to build vessels capable of bearing greater and greater tonnage. Vessel size grew from the three-hundred footers of the late 1880s to the five-hundred footers at the turn-of-the-century. Wooden steamers continued to be built. The shipyard of James Davidson in Bay City, Michigan, employed as many as one-thousand workers and was solely devoted to wooden ship construction. In 1900 they celebrated the launching of the *Pretoria*, a 350-foot schooner. Three years later the yard produced two giant schooner barges, the *Montezuma* and the *Chieftain*. They were among the largest wooden vessels ever built on the Great Lakes at 352 feet in length (the *David Dows* Built in 1881 was 365 feet in length). Despite the fact that wooden construction persisted, steel clearly was the preferred material for the design of lake freighters. But unlike wood, which remained readily available along the lakes as late as 1900, steel vessels required much greater capital investment. Therefore, the creation of fleets of steel freighters reflected the integration of the lake marine into the emerging and increasingly concentrated industrial capitalist order of Gilded Age America.²¹³

The great figures of late nineteenth-century American industry all became deeply involved in Great

213 Mark L. Thompson, *Steamboats & Sailors of the Great Lakes* (Detroit: Wayne State University Press, 1991), 22-23; *Saginaw Courier-Herald*, 25-27 July 1900;

Lakes shipping in the 1890s. John D. Rockefeller was not content with the millions of dollars his Standard Oil Trust brought him. He expanded into iron mining in 1893 when he used the tremendous leverage of his capital reserves and questionable ethical maneuvers to secure control over the rich Mesabi Iron Range in Minnesota. Rockefeller owned a railroad that brought the ore from the interior to the Lake Superior port of Duluth. What he needed was a fleet of ships to bring the ore to the mills along the lower lakes. Control of transportation had been one of the keys to Rockefeller's success in the oil business, and he saw that as the demand for iron ore grew so would the demand for shipping. As early as 1888 he invested in the American Steel Barge Company that was formed to build steel lakers. In 1895 he took an even bigger step into Great Lakes shipping, in fact the biggest investment ever made up until that time. He formed the Bessemer Steamship Company, and in spite of a continuing economic depression commissioned twelve new steel vessels, the largest of which was 475 feet in length. When those commissions were launched, he ordered twelve more new ships. Within five years Rockefeller grew his fleet of massive steel freighters to fifty-six vessels.²¹⁴

It did not take long for the leading iron and steel makers in the U.S. to wake-up to the fact that the nation's most infamous monopolist was gaining a stranglehold over the mining and shipping of iron ore. Andrew Carnegie, who had previously scoffed at investing in Lake Superior mines and lake shipping, scrambled to escape the grasp of Rockefeller's iron grip. Belatedly, he began to work with partners to purchase mines. As Rockefeller's giant fleet began to take shape, he wasted no time in raising shipping rates, and mills in need of ore had no choice but to pay his price. Rumors also abounded that the oil tycoon was looking to establish his own steel plants somewhere on the lakes. All of this prompted Andrew Carnegie, the nation's largest steel magnet, to seek a rapprochement that would forestall the entry of a dangerous new competitor. In December 1896 the robber barons agreed to an alliance. Carnegie would purchase most of Rockefeller's ore and ship it on the latter's vessels at a rate determined by the market. For his part Rockefeller agreed not to establish his own steel-making plants. The immediate result of the alliance was a consolidation of Lake Superior mines in the hands of Carnegie and Rockefeller. The two giants were able to set the price for iron ore at ruinous levels until they forced smaller producers to sell out. As Carnegie acquired more mines in northern Michigan's Gogebic and Menominee ranges, he also sought to establish an independent shipping capability. Even Rockefeller's vast Bessemer Steamship Company could not handle all of the ore Andrew Carnegie's mills required. Rather than contract with smaller shipping lines, Carnegie elected to follow Rockefeller's example and form his own fleet of ore carriers. In 1899 he purchased six freighters and ordered five new vessels built for what he called the Pittsburgh Steamship Company.²¹⁵

One of the byproducts of John D. Rockefeller's initial involvement in Great Lakes shipping was

214 David A. Walker, *Iron Frontier: The Discovery and Early Development of Minnesota's Three Ranges* (St. Paul: Minnesota Historical Society Press, 1979), 170-89, 208; William D. Ellis, *The Cuyahoga* (Santa Fe: Landfall Press, 1998), 249-57; Barry, *Ships of the Great Lakes*, 175-76; Thompson, *Queen of the Lakes*, 48.

215 Walker, *Iron Frontier*, 210-11, 225; Thomas Kessner, *Capital City: New York City and the Men Behind America's Rise to Economic Dominance, 1860-1900* (New York: Simon and Schuster, 2009), 300-302.

the development of a unique type of steel ship known as the whaleback. The design was the brain child of Alexander McDougall, an experienced inland seas mariner who thought he came up with the perfect type of ore carrier. His unconventional concept was a flat-bottomed steel hull with curved sides and an upturned bow that aided in cutting through the water. In fact, the whaleback's sloped deck was so close to the waterline that it was often awash even in moderate seas. Secure space topside was provided by two turrets, one forward and a second aft, which contained the pilothouse. By sitting



Figure 27. A passing tug showing unloaders at work on both sides of harbor, Conneaut, Ohio, c.1905.

low in the water McDougal believed his vessels would be safer in heavy seas and more fuel efficient. Rockefeller provided the key investment for McDougall to found the American Steel Barge Company in 1889. Over the next ten years McDougall built forty-two whaleback freighters and barges.²¹⁶

The whaleback's cigar-shaped hulls and snub-nosed bow caused some sailors to mockingly dub them "pig boats." They were not beloved by their crews due to the noise and vibrations that made sleep difficult when underway. They also faced difficulties in filling their designed role as ore carriers. While initially successful, McDougall could not expand the length of his hulls to keep up with the rapidly growing size of ore freighters. Most whalebacks were between 200 and 300 feet in length and the largest ever constructed, the *Christopher Columbus*, was a passenger ship not a freighter. Another problem that could not be overcome was the vessel's small cargo hatches, a necessity since the decks were often awash. Yet when machine-operated unloaders came into use at iron ports whalebacks became cumbersome and time-consuming to unload. Nor did the ships turn out to be as effective in riding out storms as McDougall had hoped. Nonetheless, although whalebacks were only built for ten years, many of those put into service enjoyed long careers. The *Frank Rockefeller*, for example, steamed the lakes for seventy-three years and endures today as a museum ship. While the whalebacks turned out to be a dead-end in Great Lakes ship design, they were an eye-catching example of the boldness and ingenuity of the lake marine.²¹⁷

²¹⁶ Neel R. Zoss, *McDougall's Great Lakes Whalebacks* (Chicago: Arcadia Press, 2007), 7-9.

²¹⁷ Zoss, *McDougall's Great Lakes Whalebacks*, 9; Mills, *Our Inland Seas*, 219.

George Hulett was in part responsible for the demise of the whaleback freighters. He was a Cleveland merchant who rather late in life became involved in the construction of equipment for coal and ore handling. In a few short years, he invented several devices that greatly improved the efficiency of moving large amounts of bulk cargoes. These included a type of conveyor belt and a machine that emptied rail cars loaded with coal or ore. He was most famous, however, for his 1899 invention of what became known as the Hulett Unloader. Giant steel walking beams lowered a self-filling bucket into the hold of a ship and scooped out the ore and then raised it up and deposited it in a rail car. Where it had previously taken days to manually unload a lake freighter, Hulett's Unloader could do the job in a matter of hours. After Carnegie Steel authorized the first one for the ore docks in Cleveland, they soon became a feature of all Great Lakes ports. The unloaders further enhanced the accelerating efficiency of lake shipping at the turn-of-the-century.²¹⁸

The growing fleets of large, steel lake freighters changed navigation on the lakes. The size of these vessels and their ability to carry larger and heavier cargoes increased the draft of the typical lakes vessel. This put pressure on the federal government to increase the depth of shipping channels such as the St. Clair Flats and all major harbors. This also had an impact on lighthouse design. Vessels needing deeper water necessarily sailed farther from shore. Taller towers were needed to ensure light station flashes were visible out on the lake.

Not all Great Lakes ports thrived in the post-Civil War era. During the 1880s and 1890s, a serious decline in traffic occurred at most Lake Ontario ports, such as Oswego. The increasingly larger ships that dominated the iron ore and grain trade were cut off from Lake Ontario by Niagara Falls and the small locks of the Welland Canal. The much-discussed Niagara Falls Ship Canal was never built. Lacking easy access to the limestone of Michigan and the iron ore of Minnesota, the easternmost of the inland seas did not share in the iron and steel boom. The ore from the once profitable iron mines in the nearby Adirondack Mountains suffered in quality when compared to the product of the northern lakes. The McKinley Tariff of 1890, which was designed to protect U.S. manufacturers from foreign competition, hurt American ports on Lake Ontario that relied upon timber and grain from Canada. Faced with hefty new duties, these products were shipped east to Montreal instead of across the lake.²¹⁹

In 1895 the Cleveland shipping firm of Pickands Mather launched the first of what became known as the "400 footers." Actually the *Victory* was only 398 feet in length, but she was big enough to earn the title "Queen of the Lakes" as the largest vessel on inland waters. She did not hold that title long. When Rockefeller was building up his fleet, some of the new commissions were classed as "500 footers." By 1900 designers at the American Shipbuilding Company in Lorain, Ohio, yet another affiliate of the

218 Elroy M. Avery, *A History of Cleveland and Its Environs: The Heart of New Connecticut*. Volume III (Chicago: The Lewis Publishing Company, 1918), 130-31; "The Hulett Automatic Ore Unloaders," *The Cleveland Memory Project*, Cleveland State University Library, <http://www.clevelandmemory.org/glihc/hulett/>, accessed January 2015.

219 Arthur Pound, *Lake Ontario* (New York: Bobbs-Merrill, 1945), 326-28; "The Lumber Era (1840-1928)—Port of Oswego, N.Y.," *The Oswego Historian*, <http://oswegohistorian.org/2010/09/the-lumber-era-1840-1928-port-of-oswego-ny/>, accessed January 2015.

multifaceted Rockefeller Empire, were planning for “600 footers.” In the decade that followed 176 steel ore freighters between 500 and 600 feet in length were built on the Great Lakes. There were so many vessels engaged in the 1,000-mile route between mills of Ohio and Pennsylvania and the Lake Superior mining district that the Lake Carriers Association estimated that “one vessel is rarely ever out of the sight of another.” The importance of this modern steel fleet to the nation’s economy can best be understood when it is realized that it would have taken 240 railroad cars to carry the cargo of a single 600-foot freighter.²²⁰

What restrained the imaginations of marine architects and their robber baron bosses was the depth of Great Lakes harbors and channels. When the Civil War ended, only a handful of major harbors had the ability to handle a vessel drawing as much as thirteen feet of water. Between 1881 and 1884 the Army Corps of Engineers was able to establish a sixteen-foot channel for the larger ports and the Sault Ste. Marie Canal. The iron ore trade which boomed after the war drove the demand for larger vessels. Between 1865 and 1884 the gross tonnage of iron ore shipped increased from 278,796 tons to 2.5 million tons. Larger vessels would be able to carry more ore per trip and with powerful new engines make more trips per season. No sooner was the sixteen-foot channel completed than the steel industry joined the Lake Carriers Association to lobby the government for a twenty-foot channel. Far from the controversy over such improvements in the ante-bellum era, Congress in September 1890 quickly approved the dredging of a twenty-foot channel. The U.S. Army Corps of Engineers estimated the cost of this to be \$3.3 million and between 1892 and 1897 most channels were improved. Ship captains, however, had to be aware that natural fluctuations in the depth of the lakes often meant that the water in some channels, particularly on shallow Lake Erie, was much lower. By the first decade of the twentieth century, all of the major harbors on the lake had been dredged to twenty feet. What this project meant for lake shipping was greater efficiency through larger ships carrying larger cargoes. With deeper channels and harbors, a lake vessel in 1905 could carry six-thousand tons more than a similar vessel back in the 1870s when a fourteen foot channel was the rule.²²¹

The growing size of Great Lakes vessels and the massive scale of steel industry plants gave rise to several new ports. The narrow and shallow Chicago River that meandered through the heart of that city’s commercial district had long been both the port and the center for manufacturing. By 1880, however, that began to change and both shipping and steel production began to migrate twelve miles south to the Calumet River. Beginning in 1869 the Corps of Engineers made improvements to this sluggish stream surrounded by massive marshes. The first rolling mill came in 1880 along with a railroad branch line and a giant grain elevator. By 1909 the area had developed into one of the greatest industrial concentrations in the world, and it was decided that Calumet would become

220 Thompson, *Steamboats and Sailors of the Great Lakes*, 37-40; *Annual Report of the Lake Carriers’ Association, 1910* (Detroit: P.N. Bland, 1911), 110; Frank Andrews, *Grain Movement in the Great Lakes Region*, U.S. Department of Agriculture, Bureau of Statistics, No.81 (Washington, D.C.: U.S. Government Printing Office, 1910), 66-67.

221 *Annual Report of the Lake Carriers’ Association, 1910*, 115; O.M. Poe, *Annual Report Upon the Improvement of Waters Connecting the Great Lakes* (Washington, D.C.: U.S. Government Printing Office, 1893), .III-IV ; Frank Andrews, *Grain Movement in the Great Lakes Region*, 56.

Chicago's principal harbor. Detroit mirrored this shift to an industrial port with the creation of an industrial harbor at River Rouge, one mile south of the city limits. The naturally deep river required less engineering than the Calumet, and industry began to gravitate there in the 1880s. A major shift away from the downtown Detroit waterfront followed the 1903 opening of the Detroit Iron and Steel Company plant on River Rouge. Henry Ford completed the transformation of the area to a bustling heavy industry workshop in 1917 when he began work on a giant automobile plant that was for a time the largest integrated factory site in the world. The Corps of Engineers made this possible by deepening the River Rouge to a depth of twenty-one feet.²²²

Many of the key navigational choke points required something more than dredging. In 1892 the Congress authorized \$3.5 million to improve all of the Great Lakes connecting channels to a depth of twenty-feet. As part of this effort a second canalized channel was completed through the St. Clair Flats, and the dredging of the lower reaches of the Detroit River made a second shipping lane in and out of Lake Erie. The bigger problem, however, was at Sault Ste. Marie. The canal once decried in the Senate as "beyond the farthest bounds of Civilization, if not the moon," was now key to the operation of the world's largest iron and steel industry. In the twenty years after 1880, traffic through the canal increased nearly twenty times what it had been. In 1895 it was typical for ships to be kept waiting five hours before they could be locked through. A second lock on the Canadian side helped somewhat as did the completion by the Corps of Engineers of the Poe Lock at Sault Ste. Marie in 1896. Ship traffic, nonetheless, was still congested until a third U.S. lock was authorized by Congress in 1907. By that time the canal was handling in its eight month season nine times the tonnage of the Suez Canal.²²³

The Lumber Trade: Twilight of the Schooners

While the magnets of iron and steel were building 500-footers and discussing the merits of triple expansion steam engines, a large percentage of the vessels upon lake waters remained sail powered. Few wooden sailing ships were built after 1886, yet the vast majority of those launched in the decades before remained in active service. Some remained in the iron ore trade, but most were employed in the transport of lumber. Lumber was a perfect cargo for the aging schooner fleet. Industry in the nineteenth-century was relentlessly extractive. While the iron mines were also extractive, they operated on a scale that kept them open for decades and they developed a small number of heavily used ports, Marquette, Escanaba, Ashland, and especially Duluth. Lumber companies in the Great Lakes resisted the consolidation of resources that typified the iron ranges, and the industry was dominated by a large number of relatively small companies that rather quickly cut through their timber land holdings. The lumber frontier, therefore, created a large number of small ports that were busy for a relatively short time and received limited infrastructure investment.

²²² "Chicago's Harbors: From the Chicago to the Calumet Rivers," *Encyclopedia of Chicago*, <http://www.encyclopedia.chicagohistory.org/pages/300044.html>, accessed December 2015; Larson, *History of Great Lakes Navigation*, 37, 42.

²²³ William Livingston, "The Commerce of the Lakes," *Marine Review*, Vol. 32, No.2 (July 1905), 26; James Oliver Curwood, "Commerce on the Great Lakes," *The World's Work*, Vol. 8, No. 6 (March 1907), 878. Congress' 1892 authorization was actually only able to lower the connecting channels to about seventeen feet and it took another bill in 1902 to meet the goal of a twenty-foot channel.

Scores of sawdust towns sprung up along the shores of the inland seas. Lake Huron and Lake Michigan were the real heart of the region's lumber frontier because they were adjacent to the best forested lands. For a decade or two small Michigan ports flourished such as Nahma, Manistique, Menominee, Ludington, Frankfort, Grand Marais, Bay Mills, Port Crescent, and Huron City. The federal government improved twenty-eight small harbors on Lake Michigan alone. When mills closed, communities shrunk, or in the case of Nahma and Port Crescent, they were completely abandoned and the harbor works were allowed to erode. The biggest lumber ports such as Muskegon, Manistee, Bay City, and Saginaw kept mills busy into the twentieth century and then found new industries. On Lake Ontario Oswego thrived on timber carried across from the wild Canadian shore. The Buffalo suburbs of Tonawanda and North Tonawanda became the great lumber entrepot on the eastern end of the lakes. In 1888 there were forty-five mills there buzzing with busy circular saws. The Buffalo area was too far away from the prime forest lands of the Upper lakes to long endure as a milling center. For a few years the mills kept busy by having large rafts of logs towed from Lake Huron. The rafts and the mills they supplied both died out in the mid-1890s. Sailing ships, however, continued to bring loads of finished lumber from Michigan and Canadian mills which were transshipped from Tonawanda down the Erie Canal. In its peak year of 1890 Tonawanda received via ship and raft from Michigan and Canada 718,650,000 board feet of lumber.²²⁴

The greatest lumber port on the Great Lakes, indeed the largest lumber center in the world, was Chicago. When the Civil War ended, Chicago was in the best possible position to dominate the lumber trade. Its location in the Lake Michigan basin gave it easy access to the best pine and hardwood forests in the United States. The economic problem with forest products was that it was a product of considerable weight and bulk either as timber in the forest or lumber at a sawmill, and, therefore, costly to move effectively. The rivers of Michigan and Wisconsin were damned and channelized to carry timber to lakeshore mills, and the vast fleet of sailing ships on the lake could then take the cargo to market. Chicago became that market because of its eight railroad lines running into the city and its Illinois and Michigan Canal link to the Mississippi Valley. Post-war railroad construction improved access to the West even more. At the vast lumber yards that covered the West Side of Chicago, buyers from the treeless prairie met the lumber barons of the north in a lucrative embrace. An English visitor in 1887 noted that "the timber yards are a considerable part of the city's surface, there appear to be enough boards and planks piled up to supply [a] half-dozen States."²²⁵

In 1867 the historian James Parton visited the Chicago lumber district. He found "miles of timber yards extended along one of the forks of the river." The harbor was "choked with arriving timber vessels; timber trains snort over the prairie in every direction." When he ventured to the lakefront, he

²²⁴ Karamanski, *Schooner Passage*, 66-9; Larson, *History of Great Lakes Navigation*, 3; Frances Hanna, *Sand, Sawdust, and Saw Logs: Lumber Days in Ludington* (Ludington, Mich.: privately printed, 1955), 14-17; George W. Hotchkiss, *The History of the Lumber and Forest Industry of the Northwest* (Chicago: George W. Hotchkiss, 1898), 661-68; James Elliott Defebaugh, *History of the Lumber Industry of America*, Vol.2, (Chicago: The American Lumberman, 1907), 444-50.

²²⁵ *London Times*, 21 October 1887; Cronon, *Natures Metropolis*, 175 ;

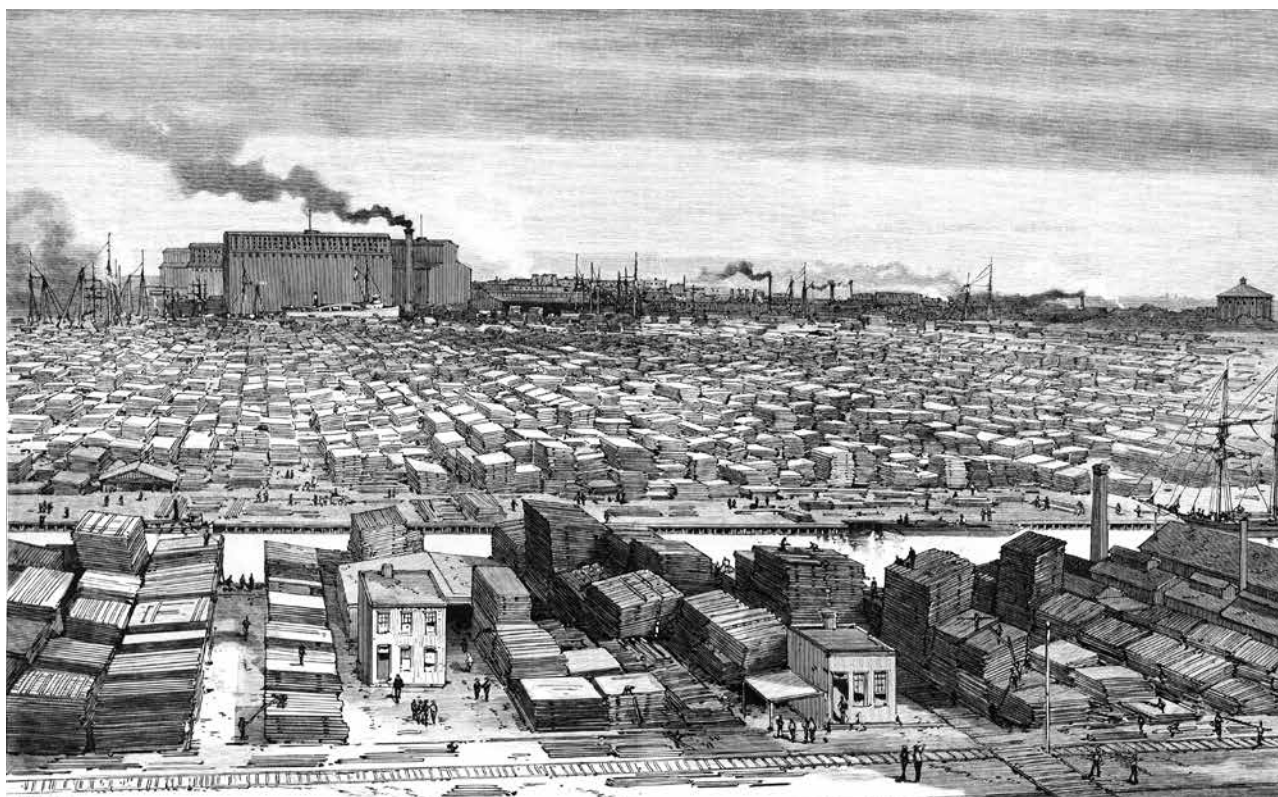


Figure 28. Chicago Lumber District.

was greeted by a blue horizon dotted with the white canvas of arriving schooners. In one afternoon “a favorable wind blew into port two hundred and eighteen vessels loaded with timber.” In the 1870s and through the 1880s around nine-thousand lumber schooners entered the Chicago River and made their way up its South Branch to the lumber district. Throughout the shipping season, hundreds of schooners were kept in constant motion ferrying lumber cargoes from mill towns like Muskegon, at the mouth of Michigan’s longest river, to the city. Some of the product of Muskegon and the Green Bay region went to Milwaukee, but the market was bigger and prices were generally better at Chicago. In Muskegon’s peak year of 1879 Chicago, only a day’s sail away, captured 86 percent of her lumber.²²⁶

Great Lakes schooners persisted, in part, because they stood at the apex of thousands of years of development of sail technology. Their simple design was remarkably efficient, and they could be successfully operated with a crew of only a half-dozen men. As new technology became available, schooners adapted to it. Late nineteenth-century schooners might employ steel cables for rigging and occasionally a steam donkey engine to operate the windlass. The amount of tonnage on the Great Lakes classified as “sail” actually increased by nearly 10 percent between 1886 and 1897. Long after schooners were driven from the grain trade by steam freighters, the vessels persisted in lumber because the cargo was impervious to their leaky hulls, and the short distance travelled made the trade less time sensitive than grain or ore. The vessels were cheap to buy and readily available as other trades

132 226 James Parton, “Chicago,” *Atlantic Monthly* (March 1867): 330-33; Rae, *Great Lakes Commodity Trade*, (Ph.D. Dissertation, Purdue University, 1967, 53-54 ; Jonathan Eyler, *Muskegon County: Harbor of Promise* (Northridge, Calif.: Windsor Publications, 1986), 25-72.

moved on to steam and steel. A few of the major logging companies, such as Hackely & Hume based in Muskegon, invested in stout, well-maintained vessels and trusted vessel masters, but much of the lumber trade was carried by tramp schooners, ships that were owned and managed from behind the ship's wheel.²²⁷

Many schooners served out their final days as barges. It was literally enough to bring tears to the eyes of experienced sailors to see a once-proud top sail schooner "stripped of her masts and sails" and "reduced" to a "menial task." John Noyes of Buffalo first began the practice of converting out-moded vessels into barges. In 1861 he stripped two former passenger steamers of their elaborate upper decks and used a tug to tow them across Lake Erie with timber for the mills of Tonawanda and Buffalo. On the upper lakes it was old schooners that were subject to conversion as lumber barges. Often the vessels would retain their masts and some of their rigging, but they would be shorn of their top sails and the crew reduced to a skeleton complement. Steam propeller tugs would haul two or three such barges the holds and decks of which would be stacked high with board lumber. In fair weather tugs and barges could transport a larger amount of lumber faster than the old clipper schooners. Yet tragedy could result when the consorts were caught in a storm and the tugs could not maintain headway with their heavy tows. It was common practice then to cut loose the schooner barge. Ideally the barge crew would deploy their anchors and ride out their storm. Too often, however, the anchor lines, old and rotted, would separate and the barge would be driven to wreck and ruin. Typical of the end of many a schooner was the destruction of the *Plymouth* in the great storm of 1913. Caught on northern Lake Michigan when the gale struck, the tug *Martin* parted its tow cable and left the *Plymouth* to weather the storm in the lee of Gull Island. A week later a message in a bottle was found washed up on a Michigan beach. It read:

Dear Wife and Children: We were left up here in Lake Michigan by McKinnon, captain of the *James Martin*; tug at anchor. He went away and never said goodbye or anything to us. Lost one man yesterday. We have been out in the storm forty hours. Goodbye dear ones. Might see you in heaven. Pray for me. Chris K.

Chris Keenan and the entire crew perished.²²⁸

The most common cause of mishaps for lake schooners were to be caught in unprotected waters and driven on to charted shoals or points of land when their anchors failed to hold. Thick fog was another frequent and almost unavoidable source of marine casualties. Yet as the fate of the hapless *Plymouth* demonstrated greater attention to crew safety was needed and in the 1890s there were regular calls for the government to inspect sailing ships and tow-barges. Steamboats faced regular government inspections, but sail vessels were not covered by that legislation. In 1896 one veteran lake captain lamented, "I have seen many schooners go out of the Chicago River which were totally unfit for anything but the junkshop. They were literally sailing coffins, but the government inspectors could

²²⁷ Karamanski, *Schooner Passage*, 73; George Gerald Tunell, *Transportation on the Great Lakes of North America* (Chicago: University of Chicago, 1898), 97; Rae, *Great Lakes Commodity Trade*, 84, 110.

²²⁸ Knut Gjerset, *Norwegian Sailors on the Great Lakes* (Northfield, Minn.: Norwegian-American Historical Association, 1928), 8; Tunell, *Transportation on the Great Lakes of North America*, 97; Dwight Boyer, *True Tales of the Great lakes* (New York: Dodd, Mead, 1971), 214-24.

do nothing.” Experienced schooner captains often balked at taking the helm of rotted vessels, and barges were routinely commanded by inexperienced sailors. This caused no difficulty if the weather conditions were ideal and the vessel stayed under tow. But if a tow was parted, many of these would-be masters lacked the skill to manage their craft and often steered them directly to the nearest shore and hoped for the best. In 1894 the schooner *J.D. Sawyer* broke loose from its tow on Lake Michigan. The captain was disoriented even though he was within sight of “one of the best known lighthouses on the lakes.” A fine protected harbor was located just down the shore, yet in a panic the man instead guided his schooner strait for shore, smashed it on the rocks and only the arrival of a fishing boat saved him and his crew from “certain death.” A vessel owner had the right to put any lubber in charge of a sailing vessel, and in the last days of the schooners too often they did just that.²²⁹

Although many were rotted and lacked even life-preservers, wooden sailing ships maintained a grip on a portion of the lake trade as long as the lumber industry in the region flourished. As lumber production declined, so too did the role of the schooner. In 1882 the Saginaw Valley of Michigan, once the cockpit of the lumber barons, reached its peak production, and within a decade, mills in the region were importing logs to cut. The Lake Michigan sawdust towns on the Michigan peninsula continued to increase production until 1890. Then lumbermen moved farther west into Wisconsin, which led the nation in production by 1900. Thereafter, there was a rapid fall off in Lake States lumber. Newer mills in the region were located far from the lake shore and moved their boards by rail. As a sign of the times, in 1915 the Lighthouse Establishment agreed to allow the U.S.D.A. Forest Service to undertake replanting operations on lighthouse reservations. Many of the most successful lumbermen either quit the business or moved to the South or Pacific Northwest where virgin forests yet awaited the saw. With the demise of the Great Lakes logging frontier came the end of the white-winged wind jammers that had once crowded the horizon with their sails.²³⁰

Emperor of the North: The Rise of the Port of Duluth-Superior

The site destined to be the United States’ greatest grain port is located incongruously more than 2,300 miles from the ocean. The southwestern end of Lake Superior had long played an important role in the fur trade with American Indians. Canoes were replaced by sailing ships and steamers after the Sault Ste. Marie Canal was completed. Prospective town sites were quickly established to cash in on the anticipated boom that would come with ships. Where the St. Louis River enters the lake, a long sand bar stretches nine miles and encloses a large natural harbor, nineteen square miles in size. At the narrow opening through this bar the town of Superior, Wisconsin, was founded in 1853. Farther up the bay on the Minnesota side of the harbor, Duluth was founded a year later. The two towns sharing the same bay became both rivals and partners. Kegs of salted lake trout and whitefish were among the

²²⁹Maritime Accidents and Casualties, Port of Milwaukee, Vol.1, National Archives, RG 35, Records of the United States Customs Service, Series Entry 1746, p.3; “Not Fit to Sail the Lakes: Some Vessels Little Better Than Floating Coffins,” *Chicago Tribune*, 29 January 1896.

²³⁰United States. Bureau of Corporations, *Report of the Commissioner of Corporations on Transportation by Water in the United States*, Part III, Water-Borne Traffic (Washington, D.C.: U.S. Government Printing Office, 1909), 180; United States Light-House Board, *Annual Report of the Commissioners of Lighthouses of the United States to the Secretary of Commerce for the Year 1915* (Washington, D.C.: U.S. Government Printing Office, 1915), 22.

first cargoes shipped from the west end of Lake Superior. It was grain and iron ore, however, that would prove to be the foundation for Duluth's dynamic growth as a maritime hub.²³¹

Numerous speculators, developers, and legislators saw the potential of the Duluth-Superior location. From the beginning plans were floated for railroads and harbor improvements. Resolutions were passed by civic, state, and federal bodies but nothing got done until the Philadelphia financier Jay Cooke stepped in and began to transform pipe dreams into iron horses. In 1863 he funded the construction of a railroad from St. Paul to Duluth. It was Cooke who insisted that the

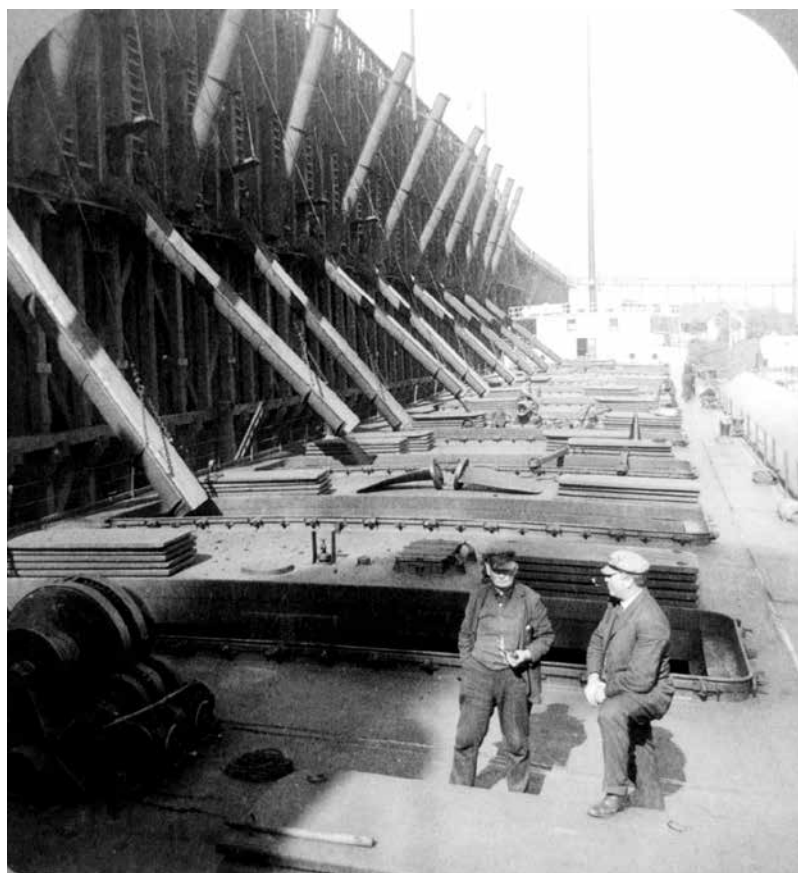


Figure 29. Lake steamer loading iron ore in Duluth harbor.

terminus be that city and not its sister Superior. In 1870 that railroad, the Mississippi and Lake Superior, was completed. Wasting no time, Cooke broke ground just west of Duluth on the Northern Pacific Railroad, a route that was projected to extend from Lake Superior to Tacoma, Washington, on Puget Sound. The route would have a long and troubled gestation punctuated by bankruptcy and reorganization following the Panic of 1873. The Northern Pacific would not be completed until 1883. In the future, other railroads would follow, but these first two railroads became the conduits connecting Duluth with the growing wheat farms of the northern Plains. The first grain elevator was constructed in 1870, and a year later the first cargoes of wheat left the harbor. The grain trade of Duluth-Superior grew quickly after that. Chicago retained its primary position in grain shipments with Milwaukee in the second place, but by the 1890s Duluth had surpassed all other ports and moved into the third position. Wheat, corn, and flaxseed shipped from Lake Superior were sent to Buffalo for transshipment to the coast. A small portion went via Canada's Welland Canal to Oswego or Montreal.²³²

231 Norman K. Risjord, *Shining Big Sea Water: The Story of Lake Superior* (St. Paul: Minnesota Historical Society Press, 2008), 112-14.

232 Risjord, *Shining Big Sea Water: The Story of Lake Superior*, 114-15; *Detroit Tribune*, 10 June 1886; Frank Andrews, Grain Movement in the Great Lakes Region, U.S. Department of Agriculture, Bureau of Statistics, No.81 (Washington, D.C.: U.S. Government Printing Office, 1910), 42. It is worth noting that improvements made by the U.S. Government to the Sault Ste. Marie Canal enabled Duluth to rapidly capture the grain trade. Meanwhile Oswego, New York on Lake Ontario lost its role as a receiver of western grain because of the failure of the United States to build a Niagara ship canal or the Canadian government to modernize the Welland Canal. In the 1870s Oswego received about 11 million bushels of grain annually by the twentieth century this had declined to less than 500,000 bushels.



Figure 30. Panorama of Duluth Harbor.

In 1906 Duluth finally bested Chicago and became the nation's greatest primary grain port. It emerged in part because of its superior access to the wheat growing states of the Dakotas and Nebraska, but changes in maritime technology also played a role. The 400- and 500-footers that dominated the carrying of grain, ore, and coal in the early twentieth century required deep harbors, broad channels, and specialized docking. Chicago's harbor, like most early lake ports, was its river, a slack stream less than a hundred yards wide. Its size was not a serious obstacle when most lake vessels were 100 to 200 feet in length, but when the size of shipping doubled, Chicago's river port was doomed. For years marine interest advocated the building of a modern harbor outer harbor on the lakefront, but little action was taken. In 1909 the city adopted a plan by architect Daniel Burnham to dedicate most of the lakefront to parks and recreation. Belatedly, both heavy industry and modern shipping were shunted south to the Calumet River where a new harbor was created. Duluth naturally had a superb harbor, and the U.S. Army Corp of Engineers improved the ship canal that connected it to Lake Superior. The grain and ore docks of Duluth-Superior were built to service the giant lake freighters. The Great Northern elevator opened in 1901, towered 243 feet over the waterfront of Superior, Wisconsin, and was one of the largest in the world. When the iron ore dock there was enlarged in 1902, it was the largest in the world. Grain boats at Duluth typically took on cargoes of 400,000 bushels which was nearly double the size of cargoes shipped from less modern ports.²³³

The Port of Duluth-Superior's efficiency was increased after 1892 when iron ore shipments began to flow through the harbor. By 1900 five million tons of ore were loaded at her terminals. Within five years that number had tripled, and by 1913 Duluth-Superior was shipping 30 million tons of ore annually. Lake vessels carried 80 percent of the region's iron ore. Without this fleet the United States could not have emerged as the world's leader in steel production. Ships carrying grain or ore east

²³³ Andrews, *Grain Movement in the Great Lakes Region*, 63; Garrett Wolf, *A City and its River: An Urban Political Ecology of the Loop and Bridgeport in Chicago*, (MA Thesis, Louisiana State University, 2012), 7; Harold M. Mayer, "Prospects and Problems of the Port of Chicago, *Economic Geography*, Vol. 31, No.2, (April 1955), 95-124; William J. Brown, *American Colossus: The Grain Elevator, 1843 to 1943* (Brooklyn, NY: Colossal Books, 2009), .210; "Lake Superior Iron Mines," *The Iron Trade Review*, Vol. 35, No.18 (May 1902): 49.



to Lake Erie returned with cargoes of anthracite coal that went into the bins of the big freighters to fuel another four-day journey east. Buffalo was Duluth's partner in this trade. Its elevators took on Western grain. The big freighters were then repositioned to the trestles where the trains that brought coal from Pennsylvania could empty their cars. In the 1880s and 1890s 1.5 million tons of coal left Buffalo to ballast the grain and ore boats. This east to west traffic, however, could not match the volume of tonnage sent down the lakes.²³⁴

In 1907 Duluth became the site of an experiment designed to take advantage of the ability of lake freighters to inexpensively supply the Lake Superior city with coal and limestone. By this time, the Rockefeller and Carnegie interests in mines, shipping, and mills had been merged with the Illinois Steel Company to form in 1901 the world's first billion dollar business—the United States Steel Corporation. Under the leadership of J.P. Morgan, the company built a model workers community at Duluth, Morgan Park, and a fully integrated steel plant. The enterprise had the added benefit of appeasing the State of Minnesota that had previously threatened to put a tax on ore shipped out of state. The mill turned out steel rails for Western railroads and attracted immigrants to the city in search of industrial jobs. By 1910 Duluth was an urban center of more than 78,000 citizens, and its sister city Superior, which had more than 40,000 people, was Wisconsin's second largest city.²³⁵

The rise of Duluth-Superior on the American side of Lake Superior was mirrored in the emergence of twin ports on the Canadian side of the border. Fort William originated as a fur-trade depot while Port Arthur had enjoyed modest growth as a mining center. Neither of these ports was of more than local importance until the Canadian Pacific Railroad began to build track west from Lake Superior and out into the vast prairies of western Canada. Those lands were the world's last great wheat growing frontier, and they became a magnet for immigrants from Eastern and Northern Europe. The population of the rolling grasslands of Manitoba and Saskatchewan surged from a mere 400,000

²³⁴ *Detroit Tribune*, 10 June 1886.

²³⁵ U.S. Bureau of Corporations, *Report of the Commissioner of Corporations on Transportation by Water*, (Washington, D.C.: U.S. Government Printing Office, 1910).149-50; Grace Lee Nute, *Lake Superior* (New York: Bobbs-Merrill, 1944), 285-85.

at the turn-of-the-century to over 1 million a decade later. Trains that brought agriculturalists west returned with hopper cars laden with the golden grain. Elevators and terminals sprouted on the Superior shore of Thunder Bay, and the demand rose for ships to bear the grain to market. The bulk of the existing Canadian-flagged commercial vessels were inadequate in both size and number. To keep U.S. freighters from securing the majority of the trade Canadian shipping, companies began a massive investment in large new steel ships. Between 1896 and 1914, the number of Canadian lakers increased by four fold from twenty-seven vessels to 124. At first the scale of this new fleet did not match the behemoths launched at U.S. shipyards. The combined tonnage of Canadian-flag grain ships increased from just over 31,000 gross tons in 1899 to a nearly 300,000 gross tons in 1914. The size of the Welland Canal locks at first limited the size of the Canadian fleet, but after 1905 they also began to add large vessels that would stay on the Upper lakes. Even though the number of Canadian ships began to grow, U.S. vessels also played a role in servicing the Thunder Bay ports. The cities and prairie towns tributary to them relied upon American coal carried by U.S. hulls. Vessels would embark from Ohio ports like Ashtabula, with good rail links to Pennsylvania coal country, and deposit the coal at a Thunder Bay port before heading down the lakeshore to Duluth-Superior for a shipment of iron-ore bound for Lake Erie mills.²³⁶

Lighthouses and the Expansion of the Lake Marine

The rise of Duluth-Superior and the establishment of other smaller iron ports at Ashland, Wisconsin, and Two Harbors, Minnesota, made Lake Superior the most heavily trafficked of the lakes by the dawn of the twentieth century. Its 1906 shipments totaled over 41 million tons, more than half of all traffic on the inland seas. Two Harbors was the outlet for ore from the Vermillion Iron Range, which was the first of the Minnesota mining districts to open in the early 1880s. The town, however, never developed into being more than a point for loading ore carriers. Ashland, Wisconsin, located east of Duluth-Superior at the bottom of Chequamegon Bay, looked for a time as if it might emerge as the principal port on Lake Superior. Ashland was the outlet for the myriad lumber camps in northwest Wisconsin's vast pinery. Then in 1872 hematite iron ore was discovered south of the town. A rush followed to what became known as the Penokee-Gogebic Iron Range, a narrow geological formation that stretched for eighty miles from the Upper Peninsula of Michigan into northern Wisconsin. British and Eastern investors poured money into mines confident that the range would "take first rank as a producer of Bessemer ore." Several great ore docks were built at Ashland reaching more than a quarter of a mile out into the bay. By 1887 there were twenty-four mines on the range and ships were carrying from Ashland's docks more than 1.3 million tons of ore. That, however, was the peak. The Penokee-Gogebic formation was both expensive to work and less rich than first believed. When the Mesabi Range in northern Minnesota was put into production, Gogebic mines could not compete and Ashland quickly declined and lost its bid to

²³⁶ M. Stephen Salmon, "A Prosperous Season: Investment in Canadian Great Lakes Shipping, 1900-1914," *A Fully Accredited Ocean: Essays on the Great Lakes*, ed. by Victoria Brehm (Ann Arbor: University of Michigan Press, 1998), 107-54.

be the great “future city on the inland sea.”²³⁷

The rise of lumber and iron ports on western Lake Superior had required the construction at an early date of a series of lighthouses. The first lights in the district were built to service the small and largely local traffic generated by the fur trade, fishing, and town speculation. These lights included the Minnesota Point (1854), Michigan Island (1856), and Long Island (1858) stations. During the first half of the nineteenth century, the Apostle Islands were the focus of settlement in the region. Following the 1855 opening of the Sault Ste. Marie Canal, towns like Bayfield, Ashland, Superior, and Duluth were created. For ships headed there, the archipelago became a hazard to navigation and lights were needed to warn off vessels. These lights included Raspberry Island (1862), Duluth Harbor (1870), Outer Island (1874), and Sand Island (1881). The development of lumbering, mining, and grain shipment greatly increased marine activity and necessitated a new round of lighthouses to be built. While vessel traffic continued east of the Apostle archipelago from Ashland on Chequamegon Bay, the heaviest shipping lane was from Duluth-Superior north of the islands around the Keweenaw Peninsula to Sault Ste. Marie. Two lighthouses were added in the 1870s that helped to guide vessels on that route, Menagerie Island (1875) and Stannard Rock (1883). Large steel freighters passed like a conveyor belt upon the Duluth-Soo lane during the busy shipping season. Lake Superior became one of the main arteries of the U.S. economy. Millions of American jobs depended upon the grain and ore in the steel holds of lake steamers. Navigational aids were erected and older ones maintained all along that route from the Duluth-Superior breakwater lights (1885), to Devil’s Island in the Apostles (1891) to range lights at Vidal Shoals (1899) marking safe passage into the St. Mary’s River.²³⁸

On the British side of the lakes, a more modest yet important expansion of navigational aids was taking place. In the wake of the American Civil War, the Royal government pushed some of its disparate North American colonies to form a political union. Several times during and just after the war tensions between the United States and Great Britain had threatened a renewal of conflict on the Great Lakes. To better prepare for such a possibility as well as to step back from direct engagement with the United States, the British fostered the Dominion of Canada, a confederation of the colonies of Canada West (Ontario), Canada East (Quebec), Nova Scotia, and New Brunswick. In 1867 the new Canadian national government then set about improving navigation on the lakes. The first Canadian light station on Lake Superior opened that year on Talbot Island just off the lake’s northern shore. The site was so remote that two of the first three keepers perished just trying to leave at the end of the shipping season. The station became known as the “Lighthouse of Doom.” Wheat shipments from the Canadian prairies to Lake Superior at Port Arthur began in 1868 and steadily increased thereafter. This made it necessary to provide more navigational aids for vessels taking the northerly track across Superior from Sault Ste. Marie to Thunder Bay. Between 1872 and 1873 three new lights were erected at Porphyry Island near

²³⁷ Eric D. Olmanson, *The Future City on the Inland Sea: A History of Imaginative Geographies of Lake Superior* (Athens: Ohio University Press, 2007), 116-25; *Chicago Times*, 25 July 1886; Walker, *Iron Frontier*, 14-15.

²³⁸ Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 358, 360, 382-84, 387, 404.

the entrance to Thunder Bay and further east at Michipicoten Island where two lights helped mark the entrance to a natural harbor of refuge.²³⁹

There remained a particularly dangerous passage for ships on the northern Lake Superior track—Isle Royale. The largest island on the lake stood astride the approach to and out of Thunder Bay. More vexing yet was a small island three-and-a-half miles off the northeast tip of Isle Royale that is known today as Passage Island. Between this rocky islet and Isle Royale was a fine deep-water channel. Yet threading the needle between the islands could be a formidable challenge in heavy seas or the frequent pea-soup fogs of the region. Clearly a lighthouse and fog signal was required at Passage Island. The territory belonged to the United States but the bulk of the ship traffic was Canadian vessels bound for a Canadian port. So necessary was a light here to the Canadian lake marine that the Dominion government was urged to purchase Passage Island from the United States. Eventually a compromise was reached. The U.S. would build a light station on Passage Island if the Canadians would put a permanent navigational aid at the Colchester Reef on Lake Erie. American ship masters had tried to mark this trouble spot with a privately funded lightship with no consistent success. Passage Island Lighthouse became operational in 1882. The Canadian authorities initially failed to keep their end of the bargain. They first attempted to contract with a private party to operate a lightship at the reef. Yet in 1881 the lightship was, without prior warning, removed and the American steamer *Antelope* plowed onto the reef. It was not until 1885 that a permanent lighthouse was established there by the Dominion government.²⁴⁰

The increase and improvement in lighthouses was mirrored in the configuration of Great Lakes lightships. Lightships had been deployed on the lakes as early as 1833. The *Louis McLane*, a purpose built forty-six foot sloop, was typical of Pleasonton era projects. The vessel was simply not stout enough even with a heavy anchor to weather a storm at its very exposed posting at the Waugoshance Shoal in northern Lake Michigan. After being repeatedly driven ashore and repaired, it was moved to the shelter of the Detroit River. In 1852 a lighthouse was placed at the shoal. It would be more than a generation before another lightship was posted on the Great Lakes, but by the 1890s it was clear that certain busy channels required additional marking. The waters where lakes Michigan and Huron come together are amongst the most crowded with shipping and tricky to navigate on the inland seas. Numerous islands, peninsulas, and shoals challenge the navigator. It is understandable, therefore, that five lightships were eventually posted in those waters. Lightships were positioned where navigational aids were required but the waters were too deep for a lighthouse and buoys were insufficient.²⁴¹

Although the Lighthouse Board had recommended in 1852 that lightships be built of iron for durability's sake, early Great Lakes light vessels were made of wood. This was in part because the

239 Elle Andra-Warner, "Lighting the Northern Edge: Lake Superior's Ontario Lighthouses," *Lake Superior Magazine* (2007) <http://www.lakesuperior.com/the-lake/maritime/lighting-the-northern-edge-lake-superior-ontario-lighthouses/>, accessed, October 2015; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 408,428-30, 433.

240 Thom Holden, *Above and Below: Lighthouses and Shipwrecks of Isle Royale* (Houghton, MI: Isle Royale Natural History Assn, 1985) 10; *Cleveland Herald*, 27, 30 September 1881; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 133, Terry Pepper, "Passage Island Light Station," *Seeing the Light*, http://terrypepper.com/lights/superior/passage/pasage_island.htm, accessed October 2015.

marine community suspected that iron would be too rigid to withstand the regular pounding lightships withstood on station. Two important improvements to lightships made a big difference in helping them to remain in place in all weather conditions. The Board increased the weight of the anchors that were critical to holding the vessels. The *Louis McLane*, which Pleasonton had sent to Waugoshance Shoal, only had an 800-pound mushroom anchor, and she was continually blown off station. By the 1880s the Lighthouse Board was securing its vessels with five-ton anchors. The other innovation began on the Great Lakes in 1891 when the Board launched three new lightships. By this time they had dispensed with naming vessels and instead each was given a number. Lightships No.55, No.56, and No.57 were all built in Toledo, Ohio, by the Craig Shipbuilding Company. Each of the ships were built of oak 102 feet in length with a twenty-foot beam and had two stubby masts from which to suspend signal flags and their beacon light. What made the vessels unique in the U.S. service was they were the first to be equipped with steam engines. This engine significantly improved their ability to remain on station because during storms, they could reduce strain on their anchor chains and if they were blown off station they could reposition themselves. The vessels were deployed to the Straits of Mackinac where they went on station at Simmons Reef, White Shoal, and Gray's Reef. Kerosene lanterns hung from each of their two masts and a large brass bell and a steam fog signal provided ample warning to mariners of the hazards they guarded.²⁴²

The three new style lightships got off to an unimpressive start in November 1891. For reasons that were never satisfactorily explained, the three ships left their stations before the close of navigation, although the season still had several more weeks before winter. They used their steam engines to dock at Cheboygan, Michigan—their winter quarters. Fortunately, the inspector for the Ninth Lighthouse District was quickly informed of this dereliction of duty. Commander Nicoll Ludlow ordered the vessels back on station. That winter he held a formal inquiry and the officers and men, with one exception, were discharged from the service. That black mark was more than redeemed by the long record of vigilance that followed. Lightship No. 55 served on Lake Michigan for thirty years. Her sisters No.56 and No.57 outlasted her by seven years and two years, respectively. After their initial deployment in 1891 other lightships joined them on the Great Lakes. Lightship No.60 was launched in 1893, and she spent her entire thirty-two year career at Eleven Foot Shoal on Lake Michigan. Eventually, there were twelve lightships stationed on the Great Lakes with the bulk of them near the Straits of Mackinac.²⁴³

Lightships were commanded by the vessel master. These men were usually drawn from the ranks of the lake marine, and in the 1880s and 1890s that meant former schooner captains. Soren Kristiansen was typical in that regard. He had been a sailor since age sixteen and spent jack-tar's life on the oceans of the world and the Great Lakes. What was untypical is that he stayed on his lightship for twenty years. When he left the roving life of the lake schooner behind, he noted in his diary: "It was an important day for me. I had spent about 25 years sailing on vessels and now I should help to guide our modern merchant fleet

²⁴² Dennis L. Noble, *Lighthouses & Keepers: The U.S. Lighthouse Service and Its Legacy*, (Annapolis: Naval Institute Press, 1997), 134-35.

²⁴³ O'Brien, *Guardians of the Eighth Sea*, 23-24; Putnam, *Lighthouses and Lightships of the United States*, 163.

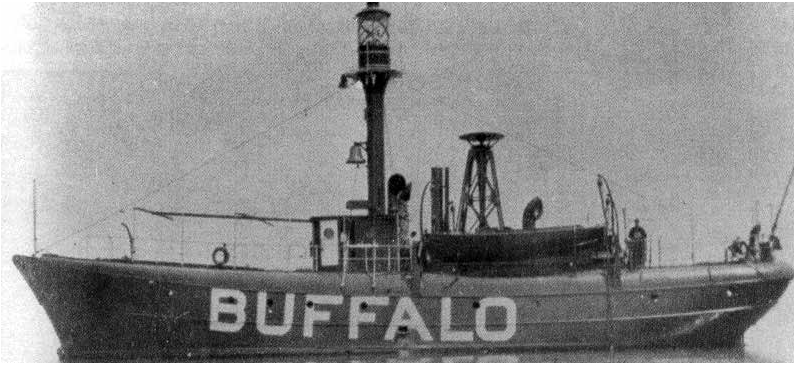


Figure 31. The lightship LV-82 before the Great Storm of 1913.

safely in and out of harbors.” From 1893 to 1913 he commanded *LV 60* stationed at Eleven Foot Shoal near the entrance to Little Bay De Noc on Lake Michigan. When he felt he was too old to tend the bobbing lightship any longer, he became keeper of the nearby Escanaba lighthouse and worked another dozen years. Life

aboard a lightship was often unpleasant. With a complement of six men—four officers and two crew—the vessels offered few comforts. Crew quarters on early vessels were below decks. This arrangement was later modified to provide a deck house amidships which contained a galley, separate rooms for the officers and a shared berth for the seamen. Tethered in place in often tempestuous seas, their home rocked and bobbed, sometimes with a violence that could throw a man from his berth. Even veteran seamen succumbed to *mal de mer* during a prolonged storm. Nor was there any escape from the wail of the fog signal when visibility became obscured. Their daily tasks were conducted with monotonous regularity, maintaining the ship, cleaning reflectors, trimming lamps, fetching fuel, and lighting and hoisting the lanterns up the mast. Ships usually had a small library, and for sailors inclined to make use of it, there usually was plenty of spare time, especially in calm weather.²⁴⁴

Over time, the design of lightships improved in an effort to make them more stable while tethered and to upgrade the quarters for the crew. One of the new ships was *LV 82* built in Muskegon by the Racine Truscott-Shell Company for just under \$50,000. She was steel built with a sloping hull similar to a whaleback freighter. This was thought to help her weather heavy seas by shedding on-coming waves. In 1912 *LV 82* was anchored on station outside Buffalo harbor guarding a shoal that had proved a hazard to shipping for a generation. The six-man crew was highly satisfied with the improved galley, cabins, and leather chairs. A steam-powered windlass and sanitary system made life aboard much more pleasant. Yet within a year *LV 82* was fated to be the first U.S. lightship to be lost with all hands. What became known as the Great Storm of 1913 bore down on the lakes on the 7th of November. It mauled shipping on lakes Superior, Michigan, and Huron as it made its way east. By November 10th it was Lake Erie's turn. Winds of eighty-miles per hour ripped across the Buffalo waterfront. The men on *LV 82* knew a killer storm was bearing down upon them, but they also knew that it was in such hazardous conditions that their navigational aid was most needed. Leaving their post was against the high standard of duty fostered by the Lighthouse Board. Sometime on the awful night of November 10th thirty-five-foot waves drove the *LV 82* off station breaking windows, smashing hatches, and ripping away ventilators. At some point amid the snow and surf, the lightship foundered. Only one crewman's body was every recovered

²⁴⁴ Soren Kristiansen, *Diary of Captain Soren Kristiansen Lake Michigan Schooner Captain, 1891-1893* (Escanaba, Mich.: Delta County Historical Society, 1981), 82; Willard Flint, *A History of U.S. Lightships* (Washington, D.C.: U.S. Coast Guard Historian's Office, 1993), 5-8.

and that after a year in the water. In 1914 a new vessel was placed at the Buffalo harbor station, but within four years the need for a lightship there was ended by an improved system of buoys.

One of the most important functions of a lightship was to provide a sound signal when visibility of the light was impaired by fog, smoke, or haze. The fog signal equipped for the earliest Great Lakes boats was a simple bell that would be rung at regular intervals. In the post-Civil War era, a horn was added so the bell and then the horn were sounded every five minutes. In the 1890s steam whistles were the common fog signal. Diaphragm horns, also powered by steam, were deployed on some vessels as well. The trouble with these steam devices is that they burned up large amounts of coal, especially on Lake Superior where fog was very common. This kept Lighthouse Board tenders busy with resupply runs. More of a problem was the havoc atmospheric conditions could play with signals as sound waves traveled through the air. Dense air could make even a powerful fog horn inaudible to someone on the deck of a vessel while a crew member aloft might hear it clearly. Too often a vessel lookout only heard the fog signals when they were almost on top of the navigation hazard.²⁴⁵

Lighthouse Board lightships played a key role in introducing the use of electricity to make a better fog signal and also a new method to execute accurate navigational bearings. Beginning in 1883 the Board funded experiments in underwater signaling. It was a private company, however, the Submarine Signal Company pioneered by the Bostonian A.J. Moody that perfected the device. In 1903 the Board put this system through several trials on Atlantic Coast lightships. In 1906 the system was deemed a success, and it was gradually deployed on most lightships. The system relied upon one of the oldest methods of sound communication—the bell and one of the newest—the telephone. A large brass bell suspended about twenty-five feet below the surface of the lightship could send a signal through the water a greater distance than could ever be heard in the air. A pulse of compressed air sent from the lightship's engine room would ring the bell. Eventually, each lightship would have its own unique ring sequence to aid identification. The sound waves passed through the water to approaching vessels equipped with receivers, basically underwater microphones. A vessel had two receivers, one suspended from the port and starboard bows, respectively. The receivers were connected to the bridge by a telephone line. If the signal came from the starboard receiver, the captain knew the lightship was in that direction. If the signal was from both receivers simultaneously, he knew that the lightship was straight ahead of the ship. While normal fog signals in good conditions were heard only a mile or two away, the submarine signals could be picked up as much as ten to fifteen miles from the lightship. By 1909 the system was deployed on eight Great Lakes lightships and one land-based station at De Tour, Michigan, on Lake Huron.²⁴⁶

245J.B. Millet, "Submarine Signaling By Means of Sound," *The Mechanical Engineer*, Vol. 20 (27July 1907): 114-15.

246 J.B. Millet, "Further Results of Submarine Signaling By Means of Sound," *Transactions of the Institution of Naval Architects*, Vol. XLIX (London: Henry Southeran and Company, 1907), 300-07 ; Submarine Signal Company, *Submarine Signals: Results of Tests Made by the United States Lighthouse Board During June and July of 1906 of the System of Submarine Signaling Controlled by the Submarine Signal Company* (Boston: Submarine Signal Company, 1906), .22-25 ; U.S. Navy, "Submarine Sound Signals," *Reprint of Hydrographic Information* No.5, 30 June 1909, 3-7. The initial shore station using the submarine signal was the De Tour Lighthouse where it was installed by the Submarine Signal Company in 1907. The water near the lighthouse, however, was not of the proper depth and so the signal was moved more than one-thousand feet off shore. Great Lakes ship owners were delighted with the system and it was quickly adopted by the large shipping companies. The system at De Tour was sold to the government in 1911.

Building a Better Buoy

One by one the lightships on the Great Lakes were replaced by either lighthouses or buoys. Minor navigational aids like buoys played a major role in improving safe shipping on the inland seas. The last decades of the nineteenth-century were a fruitful period for the development and improvement of buoys. The first buoys in the Great Lakes region were put in place by private individuals or local authorities. In 1839 federal authorities placed a buoy at the mouth of the Fox River near the modern city of Green Bay, many others followed in short order. The early buoys were crude affairs. Typical were spar buoys that were little more than painted cedar logs weighted so as to float vertically in the water. Cask buoys were simple barrels anchored in place to mark a channel or hazard. Initially the placement of buoys was the duty of a local Collector of Customs. These patronage employees of the Treasury Department usually out sourced the placement and maintenance of buoys to local private contractors who decided where and how the buoys were to be put in place. Fortunately, at least sometimes the contractors were experienced mariners with a vested interest in marking safe channels for commerce. In 1850 Congress attempted to bring some order to buoy placement. It ordered that channel markers should be color-coded so that vessels passing up a channel would position themselves so that red-painted buoys would be to their starboard side while black-colored buoys would be on the port side of the channel.²⁴⁷

By the end of the Civil War an extensive system of minor navigational aids were in place along the inland seas. In 1869 the Lighthouse Board reported that 106 buoys (barrels, cans, and spar) were in place on the upper Great Lakes and connecting waters. The St. Mary's River, leading from Lake Superior to Lake Huron, was by far the most heavily marked with forty-seven buoys indicating the navigation channel. Green Bay and the mouth of the Fox River and Saginaw Bay and the mouth of the Saginaw River, waters heavily used by lumber ships, were also closely marked. At that time only two buoys were deployed in the critical Mackinac Straits although the Board had authorized the deployment for four more. On lakes Ontario and Erie an additional 110 buoys were deployed. While the number might seem impressive, only eight spar buoys were in place on the Detroit River, a channel thronged by all vessels passing from the Upper lakes to Lake Erie. None of these early Great Lakes buoys were lit to allow for night navigation.²⁴⁸

Because of winter ice on the Great Lakes in the nineteenth century, most buoys, particularly the costly iron buoys, were removed at the end of the navigation season. Wooden spar buoys were put in their place over the winter. Great care had to be used when replacing them in the spring. In 1874 the propeller steamer *Nebraska* was stranded on Lake Michigan's Racine Reef. The master complained that the buoy marking the reef had been shifted from the middle of the reef to its edge and that "no notice" had been given of the change. While his complaint may have been an attempt to shift blame from his own

²⁴⁷ Amy K. Marshall, *A History of Buoys and Tenders*, United States Coast Guard, http://www.uscg.mil/history/web/lighthouses/h_buoys.asp, accessed February 2015, p.4.

²⁴⁸ United States. Dept. of the Treasury, *Report of the Secretary of the Treasury on the State of the Finances For the Year 1869*, 41st Congress, 2nd Session, House of Representatives, Executive Document No.2 (Washington, D.C.: U.S. Government Printing Office, 1869), 463-70.

risky course close to a known reef, it did underscore how mariners relied upon the proper placement of buoys. Generally, when a buoy or lightship was repositioned this fact was announced in the federal government's hydrographic division "sailing directions" which were published annually. These guides were the bible of the careful mariner as they described the placement of all navigational aids and issued directions on how to avoid water hazards. In dangerous waterways, such as the St. Mary's River or the busy entrances to Duluth-Superior's harbors, tugs were assigned the task of inspecting the position of buoys on a daily basis.²⁴⁹

Buoys served two principal purposes. They were used to mark navigation hazards, such as shoals and reefs, and they were used to indicate the shipping channels between lakes or at the entrance to rivers or harbors. As sentinels guarding dangerous waters, buoys were often less than satisfactory since they were very hard to spot at night or in fog. Aware of this issue, the Lighthouse Board often used buoys as a stop-gap until such time as a lighthouse or lightship could be put in position at a shoal. In 1869, for example, the Lighthouse Board approved buoys for St. Helena Island and Whale's Back Reef both in Lake Michigan. Yet by 1874 a new lighthouse station was in place on St. Helena and another recommended for Whale's Back Reef. One of the biggest problems with buoys was that they were very difficult to see at night, in fog, or heavy seas. The challenge faced by the Lighthouse Board in the 1880s and 1890s was to find a way to improve buoy recognition.²⁵⁰

There were two strategies pursued to help mariners recognize buoys. One was to equip them with sound signals and the second was to install lights on these navigational markers. Anchored in isolated waters often far from shore, lighted buoys proved a major challenge and experiments from the 1850s into the 1870s failed to meet the challenge. Sound proved easier. In 1855 Brown's Bell Buoy was adopted by the Lighthouse Board. The simple effective device suspended a bell with four clappers from the top of the float. Even waves a few inches in height were adequate to set the device clanging. Whistle buoys operating on a similar principle were introduced in the 1870s. By that time progress was finally being made on lighted buoys. The Board first experimented with Great Lakes buoys lighted by oil lamps. These proved less than reliable running out of fuel or being extinguished by wave action. A better light system was what was needed and that came in 1887 with the Foster Buoy. It was lit by acetylene, a hydrocarbon gas. Unfortunately, while the acetylene solved the fuel problem for buoys, Foster's buoys continued to be extinguished by heavy seas. Finally, a design by the Prussian Richard Pintsch solved the problem of both a long-lasting fuel and buoyancy. This design was embraced by the United States and eventually the crowded channels of the Great Lakes were lined with these devices. The Detroit River alone had eighteen Pintsch gas buoys.²⁵¹

249 United States Hydrographic Office, *Sailing Directions for the Great Lakes and Connecting Waters* (Washington, D.C.: U.S. Government Printing Office, 1896), .2, 11, 60; Maritime Accidents and Casualties, Milwaukee, RG 26, Series Entry 1746, Records of the U.S. Customs Service, Vol. 1, p.7.

250 United States Department of the Treasury, *Report of the Secretary of the Treasury on the State of the Finances For the Year 1874*, 43rd Congress, 2nd Session, House of Representatives, Executive Document No. 2 (Washington, D.C.: U.S. Government Printing Office, 1874), 674-76.

251 "Buoys: Signposts of the Sea," *Ponce De Leon Inlet Light Station*, Vol. XXXIV, No.1, (October 2009), 6-9; Amy K. Marshall, *Frequently Close to the Point of Peril: A History of Buoys and Tenders in U.S. Coastal Waters, 1789-1939*, (M.A. Thesis, East Carolina University, April, 199), 40-93; "Lighting Detroit and St. Mary's Rivers," *Marine Review* (April 1916), 140.

In the early twentieth-century, the use of acetylene was further refined for navigational aids through the work of the Swedish scientist Gustav Dalen. He developed a device that safely stored and gradually released the explosive gas so that a buoy could be left untended for as long as a year and still kept burning. His other great innovation was the sun-valve that had a sensor so the gas could be shut off when not needed in daylight. Acetylene came with its own problems as it was a volatile pressurized gas. Accidents most commonly occurred when filling or testing the pressure of the buoy. The danger was graphically illustrated in 1905 when the Canadian tender *Scout* was ripped by a massive explosion. It turned out that a buoy being filled with gas had a structural defect, and that escaping gas eventually reached the vessel's fire box. The explosion ripped apart *Scout's* superstructure and wrecked its engine room, and only the fact that she was tied up at the Kingston, Ontario, dock prevented her from sinking. In 1910 the U.S. Lighthouse Service tender *Amaranth* suffered a deadly explosion that killed a machinist and sent the buoy through the vessel's deck. Among the worst incidents was a deadly 1929 explosion that occurred off Red Cliff Point in the Apostle islands. Three crew members of the tender U.S.S. *Marigold* were killed while trying to repair a gas buoy. In spite of the dangerous qualities of acetylene it was by far the best solution to date to the challenge of lighting buoys. The pressurized gas also began the process of creating automated lighthouses. In 1916 the Charity Island Lighthouse on Saginaw Bay became the first Great Lakes lighthouse to be fully automated. Using Dalen's devices, lights at Bailey's Harbor (1923) and Green Island (1935) in Wisconsin were automated. Widespread automation, however, awaited ready access to electricity.²⁵²

Civil Service Reform and Great Lakes Navigation

In *The Devil's Dictionary* American satirist Ambrose "Bitter" Bierce defined a lighthouse as "a tall building on the seashore in which the government maintains a lamp and the friend of a politician." The humor of this observation came from the reader's recognition of its truth. This impression, however, was not one that either the Lighthouse Board or the Congress welcomed. As post-bellum Republican governments took an increasingly larger role in the economy, Civil Service reform became a major political issue. Since the days of Andrew Jackson's "spoils system," it had been widely accepted that federal employees held their positions at the pleasure of the president. While the practice had been widely criticized before, it was not until President James Garfield was shot and killed in 1881 by a disgruntled patronage seeker that reform was legislated. In 1883 the Pendleton Civil Service Reform Act was signed into law. Since patronage appointments were the life blood of political parties in the nineteenth-century, there was reluctance to remove too many jobs from partisan control. Pendleton's bill only covered about ten percent of federal employees; however, he included a provision that allowed a president to convert political jobs to civil service jobs with the stroke of a pen. This meant that with every change of administration, the outgoing executive would lock-in more of his supporters, until

146 252 Dempster and Berger, *Lighthouses of the Great Lakes* 104; "An Acetylene Explosion," *The Canadian Engineer*, Vol. 12, No.5, (May 1905): 135-36; *British Whig* (Kingston, ON), 20 April 1905; Amy Marshall, *A History of Buoys and Tenders* (Washington, DC.: U.S. Coast Guard, 1996), 10-11.

eventually most federal jobs were under the sway of the federal Civil Service Commission. Lighthouse keepers came under the system in 1896, when President Grover Cleveland issued an executive order that also included the Life-Saving Service and the Revenue Cutter Service.²⁵³

The change required that new employees be subjected to mental and physical tests to ensure they could carry out the duties. This did not have an immediate impact on the lighthouses service. The Lighthouse Board regulations had long been in place and assured keepers were literate, able to keep accurate records, and physically capable of both tending the light and operating a small boat if rescue work was needed. Regular and rigorous inspections of stations ensured keepers were vigilant to their duties. Nonetheless, it seems likely that the switch to Civil Service status brought a gradual change to the ranks of the keepers. The emphasis of physical strength and agility could not but help to reduce opportunities for individuals such as the wounded veterans or widows of keepers. Of course, Civil War veterans were reaching retirement years by the time Civil Service was instituted. There was no move to purge the ranks following Civil Service, but it is a fact that most women who served as light keepers on the Great Lakes received their appointments before Civil Service was instituted. Patronage had been the principal reason Harriet Colfax received her appointment. She was one of the ablest and longest-serving woman keepers on the lakes. The ranks of female keepers reached a peak in the 1870s and declined thereafter.²⁵⁴

Civil Service came to the Life-Saving Service on the Great Lakes when it was suffering from personnel and publicity problems. The personnel issue revolved around compensation. Surfmen were paid a mere fifty dollars a month and only held their appointments during the shipping season. They had to scramble for employment for the remaining four months of the year. When the logging industry was expanding in the period between 1860 and 1890, winter jobs in Great Lakes communities were generally easy to obtain. In 1892, however, a national depression hit that lasted the rest of the decade. During these same years the lumber industry in the region began to decline. Newspaper stories also appeared that were critical of the Life-Saving Service. Men able to secure year-round positions took those jobs and stayed in them, while many resigned from the service. In 1893 fully 30 percent of keepers and surfmen on the Great Lakes resigned their positions. In 1896 President Cleveland tried to quiet some of the criticism of the life-savers by devoting a portion of his annual message to Congress to the 4,595 individuals rescued by the surfmen at all stations during the previous year. When the Civil Service was extended, a new round of press reports circulated that Great Lakes stations were understaffed due to the new physical requirements. The Superintendent of the Ninth District was forced to issue an official statement that “the discipline, efficiency, and personnel of the station crews are far superior to what they were a few years since, and I have yet to hear a word of criticism of them

253 Ambrose Bierce, *The Collected Works of Ambrose Bierce*, Vol. VII (New York: Neal Publishing, 1911), 193; “Plums To Be Given Out: The Number of Appointments Reserved For President-Elect,” *Chicago Tribune*, 24 November 1896; George Putnam, *Lighthouses and Lightships*, (Boston: Houghton and Mifflin, 1917), 51.

254 Bethany Ann Bromwell, *Mothers of the Sea: Female Lighthouse Keepers and Their Image and Role within Society*, (M.A. Thesis: University of Maryland at Baltimore County, 2008), 6, 42-45; Mason, *Women Lighthouse Keepers of Lake Michigan*, .37-47.

from the local public.” The Life-Savers also attracted unwanted and unsought attention when Senator George McBride of Oregon unsuccessfully sought to have the men of the service receive government pensions.²⁵⁵

Changing of the Guard

Even before the introduction of Civil Service reforms, the Lighthouse Board had taken giant strides toward professionalizing the role of the lighthouse keeper. Detailed instructions to keepers were provided in manuals, such as *Instructions and Directions to Guide Light-House Keepers and Others Belonging to the Light-House Establishment*. In 1884 to foster *esprit de corps* in the service, the Board introduced uniforms for keepers. Keepers in training or in a trial period of employment were not allowed to don the indigo blue double-breasted jacket. It was reserved for proven keepers who could withstand close inspection of their stations. Since its creation in 1852, the Board had focused on expanding the scope and technical proficiency of U.S. lighthouses, lightships, and minor navigational markers. Just in the period from 1860 to 1885, the number of U.S. lighthouses had increased 84 percent. The major channels and harbors of the Great Lakes were now clearly marked by buoys, shoals guarded by lightships or illuminated markers, and lighthouses arrayed along the shores of the inland seas. By the last decade of the nineteenth century, the Board looked to new construction methods and even more efficiently and economically build lighthouses. Instead of cast-iron, all or portions of lights were erected utilizing steel plate or steel structural support. The massive Rock of Ages Lighthouse, completed in 1908 on a dangerous strip of exposed rock in upper Lake Superior, utilized state of the art skyscraper construction, with brick masonry walls and floors supported by a central structural steel skeleton.²⁵⁶ That same year saw the construction of the first reinforced concrete light, at Point Arena in California. With the ability to produce inexpensive, reliable and uniform cement, reinforced concrete soon replaced stone and brick masonry.²⁵⁷ Yet in spite of the agency’s history of unquestioned competence in 1910 Congressional action abolished the Lighthouse Board and reorganized the administration of navigational aids. The new Bureau of Lighthouses was fortunate to inherit a system that two generations of Navy and Army officers and civilian scientists had built into one of the largest and most efficient in the world.

255 “Saves No Lives Now: Chicago Lifeboat Organization Said to be Useless,” *Chicago Tribune*, 22 May 1894; “To Improve the Life-Saving Service,” *Chicago Tribune*, 28 May 1894; Fourth Annual Message (Second Term) (December 7, 1896) Grover Cleveland To the Congress of the United States, <http://www.presidency.ucsb.edu/ws/?pid=29537>, accessed February 2015; “Robbing the Nation: Pension Rolls Expanded Almost Beyond Belief,” *Chicago Tribune*, 22 December 1897; “Life Savers Ask For Credit: They Deny That They Were Intoxicated Friday—Marine Men Aroused,” *Chicago Tribune*, 20 May 1894; O’Brien, *Guardians of the Eight Sea*, 41-42.

256 Terry Pepper, “Rock of Ages Lighthouse,” *Seeing the Light*. <http://terrypepper.com/lights/superior/rockofages/rockofages.htm>, accessed August 11, 2016.

CHAPTER 6

Heartland Arsenal: The Inland Seas in War and Peace 1910-1945

In 1906 on a snowy March morning a new city began to rise from the sandy soil at the south end of Lake Michigan. It was soon dubbed the “Magic City” for the remarkable speed in which it emerged from the dunes and grew to a city of 100,000 residents. Gary, Indiana, took its name from the President and Chairman of the Board of the United States Steel Corporation, the world’s largest business. At the time of its creation the massive corporation was the amalgamation of 213 separate industrial plants and transportation companies. At the site of Gary the company built the largest integrated steel plant in the world. It eventually enclosed twelve blast furnaces and employed over sixteen-thousand workers. To make this possible, U.S. Steel completely remade the landscape of the site. The Grand Calumet River was “bodily moved...a half mile south of its ancient bed and given a new channel.” Where once wild deer were stalked by Chicago sportsmen, the lakefront was filled in and a new harbor dug over a mile in length and thirty feet deep. A broad turning basin allowed big ore carriers to maneuver without the assistance of tugs and to dock alongside derricks and automatic shovels that would rapidly unload a ship. To move raw materials and products to and from furnaces and processing plants 160-miles of railroad track was laid. In a single day more than 130 separate trains traversed those tracks. All this environmental and industrial engineering was part of a major realignment of the American steel industry. Not only did the U.S. Steel Corporation represent the future in terms of its vertical integration of all aspects of production from ore and coal mines, to ships, coke-processing plants, and limestone quarries, but it also signaled a shift away from the Ohio Valley as the largest steel producing region to the Great Lakes. The region had played an important role since the Civil War, but for a generation its plants could not match the scale of Pittsburgh’s or Bethlehem’s operations in Pennsylvania. The founding of Gary changed everything. Most of the nation’s other leading steel makers followed U.S. Steel’s lead, and in the decade that followed, they also located new plants in Gary or adjacent to South Chicago. The south end of Lake Michigan emerged as the world’s greatest iron- and steel-producing region.²⁵⁸

²⁵⁸ Powell Moore, *The Calumet Region: Indiana’s Last Frontier* (Indianapolis: Indiana Historical Bureau, 1959), 265; John C. Hudson, *Across This Land: A Regional Geography of the United States and Canada* (Baltimore: Johns Hopkins University Press, 2002), 219-22; Frederick William Howat, editor, *A Standard History of Lake County Indiana and the Calumet Region* Vol. 1 (Chicago: Lewis Publishing Company, 1915), 316.



Figure 32. Bird's eye view of U.S. Steel Gary Works, 1908.

Lake shipping was the reason for the creation of the Gary works and the emergence of the Calumet region of Lake Michigan as a steel-making center. Great steel vessels were the most cost effective way to bring iron ore from Lake Superior as well as the other materials needed for processing. The production of only a ton of pig iron required 4,000 pounds of iron ore but also about 2,050 pounds of coke (refined coal), 900 pounds of limestone, and a vast amount of water. The principal source of limestone was northeastern Michigan where deep rock formations were conveniently close to the Lake Huron shore. Pittsburgh, where the modern American steel industry had been born, declined in the face of the greater efficiency offered by mills built adjacent to lake ports. The so-called Steel City had benefited from its proximity to the anthracite coal mines, but was far from sources of limestone and iron ore. Gary, Indiana, became the greatest of the lake mill centers, and along with the Chicago mills, it absorbed 20 percent of all ore shipped on the lakes. Much of the rest of the iron ore went to Detroit and the production centers along Lake Erie, especially Cleveland, Erie, Buffalo, and Tonawanda. So efficient were the inland seas for shipping bulk cargoes, that Kentucky coal was brought by railroad to Toledo, Ohio, and then loaded on lake freighters for shipment to Gary. What one contemporary described as an “avalanche” of orders for new ships followed in the wake of the founding of Gary. Eighty new vessels were built between 1906 and 1908; and another sixty-seven were ordered by 1910, all of which were big 500- to 600-footers. Lake shipping in the twentieth century was gradually dominated by the business of making steel. This would prove a boon in times of prosperity or war when the fate of nations hung on the reliability of the lake marine, but thousands of sailors and mill workers would learn that too much reliance on a single industry could prove painful in hard times.²⁵⁹

Great Lakes navigation in the first half of the twentieth century transcended the national significance it had achieved in helping to build the modern American industrial economy of the post-Civil War era. The role it played in the construction of the great fortunes of John D. Rockefeller and Andrew Carnegie and others of the so-called “Robber Barons” had laid the foundation for the industry and

²⁵⁹ Hudson, *Across This Land*, 219-21; George J. Joachim, *Iron Fleet: The Great Lakes in World War II* (Detroit: Wayne State University Press, 1994), 17; Langdon White and George Primmer, “The Iron and Steel Industry of Duluth: A Study in Locational Maladjustment,” *Geographical Review*, Vol.27, No.1 (January 1937): 82-91.

commerce of the North American heartland to play a critical role in the global economy and global conflicts. To meet this rising global significance, the Great Lakes maritime industries and the federal agencies dedicated to navigation had to embrace new technologies and organizational structures. Great Lakes navigation had already reached standards of efficiency that would have astounded men who sailed before the mast only a generation earlier. By 1916 there were 2,865 vessels engaged in lake commerce, only a slight increase over the number recorded in 1889. Yet such was the increased size of those vessels and the efficiency with which they were able to navigate the lakes that they were able to carry almost 400 percent more cargo than the carriers from 1889. This indicates the degree to which the pace of change and innovation had quickened since the 1880s. In the face of such flux, even the image of the lighthouse as the guarantor of marine safety would face challenges.²⁶⁰

The Birth of the Lighthouse Bureau

On February 14, 1903, Congress passed the act that created the Department of Commerce and Labor. The Lighthouse Board was transferred from the Department of the Treasury, where navigational aids had been administered since the presidency of George Washington, to the new department. At the time, the nation was undergoing considerable social and political upheaval as it transitioned from being a largely rural agricultural nation to one that was urban and industrial. The self-styled Progressive Movement was a political response to these changes. Dominated by educated middle-class professionals the movement focused on social and political reform with an emphasis on efficiency and economic regulation. At first little changed in the world of lighthouses due to the change of departments. In 1910, however, the progressive mania for reorganization swept over and sunk the existing lighthouse service. Reformers were critical of the divided authority of the Lighthouse Board and the central role played by army and navy officers in a civil agency. As a result the board was abolished and a new Bureau of Lighthouses was created to be headed by the Commissioner of Lighthouses.²⁶¹ The Bureau of Lighthouses is also known as the Lighthouse Service due to the use of that term in the legislation, and it is more commonly known by that name.²⁶²

While this transition was underway, an even more fundamental change in organization was proposed. In 1910 Congress granted President William Howard Taft \$100,000 to explore ways to improve the functions of the executive branch. The resulting commission's recommendations dealt with issues large and small, from the way in which federal agencies folded and filed their paperwork to the creation of the first presidential budget. Several recommendations focused on the nation's maritime services. The most important of these was the recommendation that the new Lighthouse Bureau be consolidated with the U.S. Life-Saving Service. The commission's report documented the possible cost-sav-

²⁶⁰ Larson, *History of Great Lakes Navigation*, 56.

²⁶¹ "The President's Commission on Economy and Efficiency," *The American Political Science Review*, Vol. 5, No. 4 (November 1911): 626-28; United States President's Commission on Economy and Efficiency, *Economy and Efficiency in the Government Service: Message of the President*, (Washington, D.C.: U.S. Government Printing Office, 1912), 51-74.

²⁶² Clifford, 11, citing George R. Putnam *Sentinel of the Coasts: The Log of a Lighthouse Engineer* (New York: W. W. Norton & Co., 1937), 119.



Figure 33. George Putnam in his office.

ings and efficiency that would result from the merger. These savings largely stemmed from overlapping functions in the central administration and the streamlined-management that would come to both lighthouses and life-saving stations many of which were already located in close proximity to one another. The logical amalgamation, however, did not happen. President's Taft's commission did not report its findings until 1912, and by the time they were digested, a new administration was in power headed by Democrat Woodrow Wilson. The Democrat ordered the merger of two maritime agencies, but the marriage did not include the Lighthouse Bureau. Instead, because of last-minute maneuvering by Secretary of the Treasury Franklin McVeigh, the Revenue Cutter Service, which had been born as a military service, was merged with the U.S. Life-Saving Service and housed in the newly created U.S. Coast Guard. The new

service remained in the Department of the Treasury, save in time of war, when it would be under Navy Department command. The new entirely civilian Lighthouse Bureau continued as part of the Department of Commerce.²⁶³

The creation of the Lighthouse Bureau had once more returned the administration of the nation's navigation aids to the control of one man. Fortunately, the Commissioner was not a penny-pinching bureaucrat like Stephen Pleasonton. George Rockwell Putnam was an energetic man of science and adventure. He was a twenty-year veteran of the U.S. Coast and Geodetic Survey. During that time, he had surveyed the mouth of the Yukon River during the 1898 gold rush, participated in one of Admiral

²⁶³ President's Commission on Economy and Efficiency, *Economy and Efficiency in the Government Service*, 51-74; O'Brien, *Guardians of the Eighth Sea*, 65-66.

Robert Peary's Arctic expeditions, and charted the labyrinthine coast of the Philippines archipelago. Midwest-born, he knew the Great Lakes well from two years living in Chicago and from work on a boundary survey from the St. Lawrence to Lake Superior. He owed his appointment as commissioner to his broad experience and his acquaintance with President Taft from his six years in the Philippines where Taft had been governor-general. Many observers in both Congress and the military predicted that the new Lighthouse Bureau would become a patronage dumping-ground. Admiral Robley Evans, the former commander of the Great White Fleet and hero of the Spanish-American War, predicted that the "lustre" of the lighthouse service would be dimmed by the "fog of party patronage." Putnam took notice of the criticism and moved with great deliberation to find the right men to serve as district superintendents. He kept some of the naval officers who had performed that duty under the Lighthouse Board on duty for as long as two years until he could find the civilians with the proper experience and character. This judicious approach to his charge allowed the transition from military to civilian leadership to take place smoothly.²⁶⁴

Putnam blended genuine concern for the men and women of the Lighthouse Service with his insistence on efficiency. He frequently traveled to distant light stations to see how his people lived and worked. This knowledge gave him the confidence to request and receive salary increases for the service. In 1917 he noted that there were more than ninety keepers older than seventy, and that although some of them had served well for forty years, it became harder for them to ascend tall towers to do their duty. Yet he did not institute a program of retiring the elderly keepers until he could secure a federally-funded pension. He had to overcome Congressional objections because the light keepers were civilians and, thus, did not qualify for federal pensions. Putnam countered that they were eligible to be put into the military in time of national emergency. He also pointed out that each year more than one hundred of five-thousand light keepers were injured in the performance of their duties, which included undertaking life-saving rescues. Not only was Putnam able to secure pensions for long-serving keepers, he also was able to get Congress to approve the General Lighthouse Act of 1918 which provided pay raises for service staff. This accomplishment underscored the credibility that Putnam was able to maintain with the Congress throughout his tenure. Putnam earned this trust because he was able to demonstrate that he ran the service like a "tight ship." By the time he retired in 1935, less than 1 percent of the Lighthouse Service personnel, forty staff, were engaged in administrative duties in Washington D.C. He did this despite doubling the number of navigation aids during his tenure. Putnam had his men and women where they could do the most good to mariners, on duty along the nation's navigable waterways.²⁶⁵

Like Gifford Pinchot in the Forest Service, Putnam was a model of the progressive bureaucrat.

264 Judi Kearney, "George Rockwell Putnam: Commissioner, Bureau of Lighthouses," *Lighthouse Digest*, (July/August 2012) <http://www.lighthousedigest.com/digest/StoryPage.cfm?StoryKey=3558>, accessed February 2015.

265 Lighthouse Service, Hearings Before the Committee Interstate and Foreign Commerce of the House of Representatives, Sixty-fifth Congress, Second Session, on HR 7913, 9 February 1918 (Washington, D.C.: U.S. Government Printing Office, 1918), 28-31; Robert Erwin Johnson, *Guardians of the Sea: History of the United States Coast Guard, 1915 to the Present* (Annapolis: Naval Institute Press, 1987), 162.

He moved socially in the capital's highest circles winning support for his service at private dinners and through elite social clubs such as Washington's Cosmos Club where he served as president. He was a founding board member of the National Geographic Society and participated in international conferences on marine safety. He was not too proud to court the capital's leaders. When Woodrow Wilson's Secretary of the Treasury, William C. Redfield, took a cruise on the Great Lakes he proudly flew a departmental ensign from the ship's masthead. As he sailed by each lighthouse, he was impressed to see that each lighthouse keeper saluted his passing. Redfield was "loud in his praise of the alertness of the light keepers." He never knew Putnam had forewarned his Great Lakes keepers of the Secretary's itinerary. He also was not afraid to stand up to elected officials if he thought their actions threatened the efficiency of his department, but he did so tactfully. Once he noticed a rider on an appropriation bill that directed several thousand dollars to the Lake Michigan Lighthouse depot for a new barge. Upon investigation, he discovered no such request was made or wanted by the service. Putnam sequestered the funds. After some months, the Congressmen who had inserted the bit of "pork" asked Putnam why the barge contract had not been given. Putnam explained the barge was not needed. When the Congressman objected, Putnam offered to write a full explanation and send it to the House Committee on Appropriations. "The Representative," Putnam later recounted, "promptly asked that the barge matter be dropped, and it was never heard of again." Putnam also kept the name of the service before the public through the publication of well-written books and articles. In all venues, he made it clear that he stood for efficiency and scientific management, watchwords of the era. His broad public profile, his wide-ranging experience as a map maker, and the inventive age in which he lived all combined to make his time managing the nation's lighthouses one of great technical advancement in navigation and navigational aids.²⁶⁶

The Unfulfilled Promise of Electrical Navigational Aids

The wonder of the late nineteenth and early twentieth-century was electricity. Through the work of Nikola Tesla, Thomas Edison, and George Westinghouse, what for generations had been feared as a strange and uncontrollable source of power, was harnessed to bring light to homes, illumination to city streets, music without orchestras, moving picture images to theaters, motor-power to horseless carriages, and cheap energy to industry. The application of electricity to navigational aids was well underway before the creation of the Lighthouse Bureau, but in the first three decades of the twentieth-century, the bureau expanded its application in new and unanticipated directions.

The submarine fog signal initially deployed in 1901 was the first successful harnessing of electric power for navigational aids. Earlier attempts using electricity for navigation had not been crowned with success. In 1888 the Lighthouse Board thought they had found a way to light channel buoys with incandescent lights connected by a cable to a shoreline power source. Although initially impressed with the results, the electric buoys were abandoned as impractical in 1903. Too often ships' propellers

154 ²⁶⁶ George R. Putnam, *Sentinels of the Coast: The Log of a Lighthouse Engineer* (New York: Norton, 1937), 284-86.



Figure 34. This c. 1905 advertisement for the Clark Wireless Telegraph and Telephone Company fancifully illustrated wireless communication between stations in Detroit, Buffalo, and a ship on Lake Erie.

inadvertently severed the electrical cables. It was in the field of wireless telegraphy that the potential of electricity to revolutionize navigation first became apparent. In 1898 Guglielmo Marconi, an Italian inventor working in Great Britain, succeeded in effecting the first ship-to-shore wireless Morse code message. Thomas E. Clark, an inventive self-taught electricity wizard and capitalist based in Detroit, was not far behind. In 1899 Clark erected an antenna atop a Detroit skyscraper and within a year was sending messages to ships of the Detroit and Windsor Ferry Company. By 1903 Clark's company was able to expand into transmitting voice messages as well as Morse code. Passengers on the steamers could call friends on land for the rather steep fee of five dollars. Clark eventually built six transmitting stations along the U.S. shore and one in Canada, and expanded his service to other shipping lines. He transmitted music and news, although only a handful of people at a time huddled around a receiver could hear what was being sent. The same year that Clark began to send ship-to-shore messages, the Marconi Company was approached by Ann Arbor Railroad to set up wireless communication from Frankfurt, Michigan, where the railroad terminated and its car ferry that connected across Lake Michigan to the Upper Peninsula town of Menominee, Michigan. It is unclear when the system went into operation, but it was working in 1906. By 1912 wireless technology had advanced to the point that it could have and should have been standard on Great Lakes commercial vessels. Before that would happen, however, a bitter lesson had to be learned.²⁶⁷

In 1913 the greatest of the feared "gales of November" swept across the Great Lakes and reaped a terrible harvest in lives and ships. As the month began, a low pressure system bore down from Alaska,

²⁶⁷ Marshall, *Frequently Close to the Point of Peril: A History of Buoys*, 40-60; Erik Barnuw, *A History of Broadcasting in the United States: Volume 1: A Tower of Babel* (New York: Oxford University Press, 1966), 22-34; *Western Electrician*, 16 May 1903: 385; *Electricity, a Popular Electrical Journal* Vol. 17, No. 25, (1899): 387; *Duluth Evening Herald*, 15 September 1909, 22 July 1911; *Detroit Free Press*, 24 April 1912.



Figure 35. Headline of Detroit News after the 1913 storm.

and by November 7 it slammed into the unseasonably warm air of an “Indian summer” that had been enjoyed on the lakes. That a storm would result was no surprise to the Weather Bureau. They had charted the low pressure system since it had formed over the Bering Sea. Bureau officials in Cleveland placed courtesy phone calls to shipping companies on the lake warning them of a likely storm. The warnings were by and large dismissed. They were preparing vessels for what might be

their final run of the season, trips that were critical to clients anxious to build up inventories before the shipping season closed. Some vessel captains were anxious to end the season by making a good impression on the owners and the prospect of bonuses may have influenced others. Both mariners and their corporate masters had faith in the strength and durability of the big modern steel ships that made up the backbone of the grain and iron ore trade on the lakes.²⁶⁸

The storm that struck Lake Superior on November 7 exceeded the expectations of the most experienced lake sailors. The low pressure system from Alaska collided over the warm waters of the lakes with a storm front moving in from the southeast creating something unprecedented in the region—a hurricane. The Weather Bureau issued an updated warning, but it did not get to many vessels already out on the lakes or those just preparing to depart. The reason was that most of the “modern” steel freighters had not been equipped with the wireless communication systems that had been perfected over the previous decade. While they knew storm warnings had been issued, they had no idea they would be facing hurricane force winds. That was not true of the vessels operated by the Shenango Shipping Company, a subsidiary of a Pittsburgh-based steel maker. The company operated some of the newest best-equipped vessels on the lakes. In 1911 they launched the *James M. Schoonmaker* a 617-foot monster that was at the time the biggest vessel on the lakes. It was also the first to be equipped with a wireless telegraph. By 1913 all vessels in the Shenango line had wireless telegraph capability. This enabled them to receive immediate weather updates and thereby avoid the great November hurricane.²⁶⁹

268 The 1913 storm has given rise to a virtual sub-genre of Great Lakes historical articles and books. Frank Barcus's *Freshwater Fury: Yarns and Reminiscences of the Greatest Storm in Inland Navigation*, (Detroit: Wayne State University Press, 1986) contains many primary source accounts of mariners caught in the deadly gale. Among the strong book-length histories of the event are David G. Brown, *White Hurricane: A Great Lakes November Gale and America's Deadliest Maritime Disaster* (New York: McGraw-Hill, 2002); Robert J. Hemming, *Ships Gone Missing: The Great Lakes Storm of 1913* (Chicago: Contemporary Books, Inc., 1992); and most recently Michael Schumacher, *November's Fury: The Deadly Great Lakes Hurricane of 1913* (Minneapolis: University of Minnesota Press, 2013).

269 Schumacher, *November's Fury*, 6-11.

The ships that lacked wireless receivers and sailed were caught out on the lake and were unable to find a sheltered place to drop anchor. Most were devastated by the storm. Nineteen vessels were sunk by the heavy seas whipped up by winds surging between seventy and ninety miles per hour. Another nineteen ships were driven ashore. Between 235 and 250 mariners and passengers were killed. The worst losses were on Lake Superior where the storm first broke and Lake Huron where the storm built up tremendous power as it swept the uninterrupted two-hundred miles toward its Lake St. Clair outlet. Ships that managed to bear the gale all the way down Huron's furious surface faced great danger as they approached the narrow mouth of the St. Clair River. They were in whiteout conditions with visibility down to a few hundred feet at best. One vessel in that position was the *J.H. Sheadle*, a 530-foot vessel loaded with grain from the prairies of western Canada. Captain Stephen A. Lyons struggled to ascertain his position. In vain his lookouts strained to catch sight of either the Fort Gratiot Lighthouse or the lightship *LV 61*. Lyons tried to navigate by his Lake Survey charts. Every fifteen minutes, he took depth soundings then tried to compare them to the depth recorded on the chart. This was hardly fool-proof. After proceeding this way for more than an hour and still failing to see the lighthouse at Lake Huron's outlet, Lyons felt he was forced to make a dangerous change of course. The storm was driving him to ruin on Huron's southern shore. The only way to avoid this was to turn around and head north until the gale blew itself out. Yet to do this he would have to run broadside in the heaviest seas he had ever seen. Other vessels that tried the broadside maneuver that day were capsized, but without navigational aids to show him the way to the shelter of the St. Clair River, Lyons felt had no choice. Fortunately, he was able to make the maneuver successfully. Another ship in the same predicament declined to make the dangerous maneuver and the *H.B. Hawgood* beached itself.²⁷⁰

Other vessels being driven toward the Lake Huron outlet relied upon the light and fog signal of the lightship *LV 61*. Unfortunately, the severe winds drove the lightship several miles off station. This problem was compounded when the keeper insisted on keeping the beacon and steam whistle in operation, lamely claiming he needed permission from Washington, D.C., to extinguish them. By doing this he lured passing ships to destruction. Instead of guarding the entrance to the St. Clair River and protecting ships from the dangerous Corsica Shoal, the lightship was far over on the Canadian shore. When a tug boat captain noted the looming danger, he steamed through the heavy seas and offered to tow the lightship back to its proper station. *LV 61*'s master again displayed poor judgement by refusing the offer out of fear that headquarters had not authorized the action and the twenty-five dollar charge might be taken out of his pay. As a result, when the steamer *Northern Queen* approached the St. Clair River with almost zero visibility, the captain relied on the sound of the lightship's fog signal to estimate his position. But since the lightship was far off its station, this normally safe procedure had the effect of guiding the vessel right on to a reef of rocks just north of Sarnia, Ontario. Fortunately, there was no loss of life and the crew was able to escape to dry land. The 532-foot *Matthew Andrews* was also placed

270 Schumacher, *November's Fury*, 74-77.

in danger by the folly of the master of *LV 61*. Captain Joseph Lampon had successfully guided his ship down the storm-tossed length of Lake Huron only to lose his bearings when he could spot neither the Fort Gratiot Lighthouse nor *LV 61*. Rather than proceed blindly, he put out two anchors and hoped to weather the gale in place. The next morning with the gale unabated, he was relieved to see the beacon of the lightship. He thought this gave him a solid fix on his position, and he got underway only to ground on Corsica Shoal where the lightship should have been. With no wireless equipment there was no way to warn these vessels that they were being guided by an errant beacon.²⁷¹

While the performance of *LV 61* clearly did not reflect the highest standards of conduct for the U.S. Lighthouse Service, the great storm of 1913 did exact an awful price from one lightship that did maintain its station in the teeth of the gale. *LV 82* was one of the newest and best lightships on the lakes. Stationed near the entrance to Buffalo harbor the vessel warned ships away from the Waverly Shoal. Her whaleback deck was thought to make her especially capable of safely riding out the worst storms, but sometime during the night of November 10-11 she sunk with the loss of all of her six crew members. She was only the second lightship sunk at station.²⁷²

The Wireless Ship Act of 1910 could have mitigated some of the storm losses, which exceeded \$4 million dollars. However, the Lake Carriers Association, which since 1880 had represented shipping companies on the inland seas, lobbied to be exempt from the Act. As written, the Act only applied to passenger vessels. In 1912 Congress extended the requirement to all cargo vessels, but again the Lake Carriers Association won an exemption for lakers. The Association's spokesman assured Congress that because his ships were almost constantly within sight of land, they were never in danger and that ship-to-ship communication via wireless was unnecessary because the tremendous volume of shipping on the lakes meant that vessels were seldom out of visual observation by other ships. He made no mention of storm or fog conditions. Even after the bitter lessons of 1913, Great Lakes shipping companies resisted calls for modern communication equipment on the grounds of cost. The equipment was one problem, but an even bigger cost was hiring two skilled Morse code operators for each vessel. Nor were vessel masters anxious to be in twenty-four hour contact with their employers. Many opposed the new equipment on the grounds it would tend to give "too much control over the operation of the ships to the home office." The upshot of this was that it was not until after World War II that wireless telegraph or radiotelephones became standard on Great Lakes freighters.²⁷³

The slowness with which Great Lakes vessels adopted wireless communication reflected a conservative approach to navigation and marine safety by the Lake Carriers Association. Formed by shipping companies for shipping companies, the association was more successful in blocking changes than taking the initiative. A good example was the development of navigation courses on

271 *Globe* (Toronto), 12 November 1913; "The Greatest Storm in Lake History," *Marine Review* (March 1914):.1-24; Larry and Patricia Wright, *Lightships of the Great Lakes* (n.p.: Privately Printed, 2011), 62-64.

272 Schumacher, *November's Fury*, 134-36.

273 Thompson, *Graveyard of the Lakes*, 284, 341; United States Congress, Senate Committee on Commerce, *Safety of Navigation on Water: Hearing Before a Subcommittee, Sixty-Second Congress, Second Session*, (Washington: U.S. Government Printing Office, 1912), 238-39.

the lakes. Collisions between vessels were all too common especially in the summer season when fog was frequent and especially in the busy waters where lakes Michigan, Huron, and Superior came together. At the peak of the navigation season in the late 1890s as many as one hundred vessels passed through those waters every hour. As early as 1897 a proposal was made to reduce collisions in the narrow waters. By that time more than 150 ships had been sunk on the lakes due to collisions and the frequency was growing each year. Captain J.S. Dunham of Chicago proposed that shippers adopt a page from the railroad industry which built double tracks in congested areas to allow trains to safely pass each other. If a navigation course for up-bound vessels could be separated by several miles from that proscribed for down-bound ships, the danger would be much reduced and captains could travel at a higher speed in confidence. Although Dunham was a veteran of more than thirty years as a vessel owner and the president of the Lake Carriers Association, the members rejected the plan because the proposed navigation courses took ships slightly off the most efficient track. It was not until 1914 that Dunham's proposal was finally adopted and then only after a special committee on Aids to Navigation made up solely of vessel captains made the recommendation. The first year it was implemented there was only a single total loss due to collision in the fog. On the other hand, there was no mechanism to enforce the rule, and for several years after Dunham's plan was adopted some old skippers continued to sail the courses they wanted to sail when they wanted to sail them. A common sentiment among captains of this ilk was "I don't want our office telling me how I shall steer my boat."²⁷⁴

It was this same type of conservatism by mariners combined with penny-pinching by ship owners that retarded the adaption of wireless communication. The period from 1909 to 1917 was one of consolidation on the Great Lakes. The tremendous shipping boom that John D. Rockefeller had set off in late 1890s had led eventually to an overbuilding of lake vessels so that by the time of the great storm in 1913, there were too many vessels chasing too few cargoes. In 1909 there were 597 vessels enrolled with the Lake Carriers Association, which did not count many of the older wooden steamers or sailing ships that still tramped the lakes. As vessels were taken out of service in the next five years, the fleet of elite ships was reduced to 438, a reduction of 25 percent. Sailing ships underwent an even deeper decline. From a peak of more than 1600 in 1880 the graceful old schooners were reduced to half that number by the turn-of-the-century and by 1930 the last commercial sailing ship, *Our Son*, foundered in Lake Michigan.²⁷⁵

The Great War on the Great Lakes

In January 1919 a group of very self-satisfied ship owners met at a downtown Detroit hotel. Their goal was to plan the coming navigation season on the Great Lakes. They reviewed the insurance rates that had been set by underwriters and listened to representatives of steel makers who offered projections on the year's likely production goals. With this in mind they could determine how many ships would

²⁷⁴ *Chicago Tribune*, 26 October 1897; Mansfield, *History of the Great Lakes*, Vol.1, 504-5; Thompson, *Graveyard of the Lakes* 167; "Welfare Work of the Lake Carriers Association," *American Iron and Steel Institute Bulletin*, Vol. 3 (January 1915):150-74; *Chicago Tribune*, 5 July 1914.

²⁷⁵ Thompson, *Graveyard of the Lakes*, 255.



Figure 36. U.S. Emergency Fleet Corporation Poster, 1918.

be put into service in the coming season. There also was considerable discussion of what had transpired since their last meeting in January 1918. At that time the United States was deeply involved in the greatest war the world had ever seen. The challenge of projecting United States military and industrial power across the Atlantic absorbed virtually the entire nation. In order to meet the demands of a military mobilization that eventually included 3 million men and to supply that force as well as American's overseas allies, the federal government took unprecedented action. In December 1917 President Woodrow Wilson ordered the establishment of the United States Railroad Commission to administer the nation's rail network. On the ocean, the government took similar action through the Emergency Fleet Corporation, which embarked on a massive shipbuilding program and managed the U.S. Merchant Marine.

On the Great Lakes, however, there was no government take-over. The independent members of the Lake Carriers Association continued to transport the bulk of America's iron ore, limestone, and coal without regulation. By November 1918 Germany and its Austrian and Turkish allies had been defeated, and the executives of America's inland seas fleet gave themselves a hearty pat on the back for the role the lake marine played in making that happen.²⁷⁶

In some ways, World War I came at a fortuitous time for lake shippers. There was a glut of vessels engaged in the iron ore and grain trade on the lakes. However, when Europe went to war in August 1914, there was an ever-escalating need for shipping on the Atlantic as Great Britain and France came

160 276 "Private Operation Meets the Test," *Marine Review* Vol.50, No.3 (March 1920):1; "Brokers Attend Lake Convention," *The Eastern Underwriter* (New York) 23 January 1920: 26 ; David M. Kennedy, *Over Here: The First World War and American Society* (New York: Oxford University Press, 1980), 252-54.

to rely on food and manufactured goods produced in the United States. Instead of having vessels idled in lake ports, shippers found their surplus freighters in great demand on saltwater. During the course of the war, 149 vessels were transferred from the lakes to the Atlantic trade. Virtually all of the modern ships on the inland seas, whose size would allow them to pass through the Welland Canal, went east and dared the war-torn waters around Britain and France. Dozens of Great Lakes freighters too large for the Canadian canal locks were cut in half, passed through the canals, and then reattached for Atlantic duty. The lake marine contribution became even greater after the United States directly entered the war in April 1917. The nation embarked upon a massive program of shipbuilding. The Germans had engaged in unrestricted submarine warfare with the understanding their U-boats would be able to so inhibit the deployment of the U.S. military that they could win the war in France before American participation could change the balance of power. President Wilson and his administration realized that to upset that logic would require more than the marshalling of the nation's existing merchant marine. A constant flow of new vessels was required to make up for the loss of ships to torpedo attacks. The federal Emergency Fleet authority contracted extensively with Great Lakes shipyards to produce these vessels. A full 25 percent of all ships produced by that authority slipped out of the stocks of Great Lakes shipyards. In only twenty-eight months, Great Lakes shipbuilders produced 374 cargo vessels to get U.S. men and material "Over There."²⁷⁷

Great Lakes shipping interests did not escape entirely from government regulation. While federal authorities saw no reason to supersede the allocation of vessels for the grain and iron ore trade they did step in to prevent job actions that might slow vital war production. In September 1917 the Lake Seamen's Association threatened a strike unless the Lake Carriers' Association changed key terms of its labor agreement. The sailors wanted terms similar to those the U.S. Department of Labor had helped to negotiate for Atlantic shipping. In particular they wanted the Lake Carriers' Association to end its practice of black-listing certain seamen because of their union activities. The Lake Carriers' Association had such a policy in place since 1908. The great demand for sailors also impelled the men to demand an increase in wages and used that shortage to push for an improvement in working conditions for the deckhands. They complained that deckhands were treated like "bums" and not given the type of training that would qualify them to eventually become able seamen. The federal authority stepped in and ordered the Lake Carriers' Association to stop keeping a black list, but disavowed the validity of the sailors' other grievances. In a time of national emergency when so much depended upon the movement of grain and iron ore a strike would be harmful to the national interest. They hinted that if the lake sailors rejected this ruling they would use some of the thousands of young naval recruits at the Great Lakes Naval Training Center to man idled vessels.²⁷⁸

The produce of the American heartland, especially steel and food, were war-torn Europe's greatest need. Unfortunately a poor harvest in 1916 caused a near panic among the intended recipients. The

²⁷⁷ "Private Operation Meets the Test," *Marine Review* (1920), 1; *New York Times*, 16 December 1917.

²⁷⁸ *Chicago Tribune*, 9 September 1917; 26 July 1918; *New York Times*, 28 July 1918.

price of grain soared as a result, reaching heights not seen since the American Civil War. Nonetheless, the British purchased 203 million bushels of the 1916 wheat harvest, twice as much as the United States normally exported to all countries. By April 1917 the need for grain in Europe was acute even though the price continued to spiral upward, increasing by nearly three-fold within a year. As soon as ice left the Straits of Mackinac Great Lakes grain ships set off for the Buffalo terminals. That first day of the shipping season in 1917, 4.3 million bushels alone set sail from Chicago with 17 million bushels awaiting shipment. The high demand ensured that by 1917 Midwestern farmers were plowing up every possible bit of acreage to secure a bumper crop. Expectations of a great profit were high, and across the region farmers, brokers, and shippers followed with great interest the fluctuations of the military campaigns.²⁷⁹ Steel prices increased by three-fold between 1914 and April 1917. When the U.S. entered the war, that action triggered a further price escalation. Demand for iron ore, however, was not at all curtailed by the high price. In 1917 and 1918 the Great Lakes ore fleet operated at near record levels delivering 33 million tons.²⁸⁰

As in any war a certain amount of hysteria rolled over the lakes. The region both in the United States and Canada boasted a very large German immigrant population. Actual acts of sabotage by German agents in the United States, such as the 1916 Black Tom Island explosion at a New Jersey munitions plant helped to fuel fears in the Great Lakes region. In the summer of 1917 the U.S. War and Justice departments announced with great fanfare their belief that German agents, aided by American citizens, were behind a series of “accidents” designed to disrupt the movement of grain and iron ore. In May the collision and sinking of two steamers near the Sault Ste. Marie locks was suspected of having been an attempt to block that critical choke point. Then the sinking of a vessel in the Detroit River raised similar suspicions. Soon every engine failure or boiler explosion was being chalked up to German agents. When two colliers caught fire in Little Sodus Bay, the fact that the coal they were carrying was bound for a Canadian munitions plant seemed reason enough to infer sabotage. Close investigation, however, could not substantiate enemy action on the inland seas.²⁸¹

Following the war’s end in November 1918, a victory celebration of sorts was held at a series of Great Lakes ports. A German submarine, the *UC-97*, had been awarded to the United States as a prize of war, and in 1919 she was brought to the inland seas to stimulate a war bond drive. After attracting considerable crowds, the former terror of the high seas was moored in the murky Chicago River for nearly two years. The German vessel’s final voyage was to the bottom of Lake Michigan. On June 7, 1921, the *UC-97* was towed out into the lake and sunk in a naval gunnery exercise. Ten shells from the *USS Wilmette* riddled her hull and she plunged 250 feet to the lake bottom. In the protected waters

279 Fred A. Record, “Grain Trade Upsets in 1916 Caused By War,” *Chicago Tribune*, 30 December 1916, p.A1; *Chicago Tribune*, 23 April 1917; 26 March 1918; Tom G. Hall, “Wilson and the Food Crisis: Agricultural Price Control during World War I,” *Agricultural History*, Vol. 47, No.1 (January 1973) p.25-46.

280 Robert D. Cuff and Melvin I. Urofsky, “The Steel Industry and Price-Fixing during World War I,” *The Business History Review*, Vol. 44, No. 3 (Autumn 1970): 291-306; “Traffic on the Great Lakes in 1921,” *Marine Review*, Vol. 52, No. 2, (February 1922): 80-83.

of North America's Great Lakes, this was the only vessel lost to hostile fire on account of the war.²⁸²

One result of the inland seas' strong support for the war on the Atlantic was that from 1914 to 1919 there was virtually no new shipping added to the lake marine. Lake shipyards were focused on war contracts, and the only aid they gave lake shipping was occasionally patching up one of the busy freighters. Thus, when the war ended, there was a tremendous glut of shipping on the nation's seacoast but a pent-up demand for new vessels on the inland seas. This enabled Great Lakes shipbuilders to immediately transition into new commercial contracts. By 1921 there were twelve new lakers under construction.²⁸³

Although the United States' actual involvement as a belligerent in World War I only lasted a year and a half, the conflict had many long-lingering impacts. One of the most long-lasting was the impact on American agriculture. The dizzying heights to which grain prices had climbed due to the war induced farmers to over-extend themselves. Between 1915 and 1918 the prices farmers received for crops and livestock had doubled. The dislocation caused by the World War I and the Russian Revolution and Civil War kept international demand elevated until 1921. By then Europe had recovered and U.S. harvests faced many global competitors. Prices plunged by 40 percent for farm products, and after eight years of spectacular growth, the incomes of American farmers sharply fell. The rural United States entered its own depression and hundreds of farmers, particularly those in marginal areas like the Great Lakes cutover lands, lost their homes. The lake marine was inevitably impacted by the slowdown in production that followed. There was also, however, a positive impact for lake shippers. The crisis in rural America inspired calls for government action. One plan endorsed at a White House Conference called by President Warren G. Harding supported the building of a new Great Lakes-St. Lawrence Waterway. The war had shown the inadequacy of the Canadian-owned Welland and St. Lawrence Canals. Their antiquated locks prevented most lakers from being able to move into Atlantic waters. If American grain could be shipped abroad directly from Duluth or Chicago terminals, Midwesterners would have enhanced access to the world market. Thus was implanted in the public mind a new internal improvement project that would have a long and in the end unsatisfying life.²⁸⁴

A Deep Water Access to the Sea, 1920-1939

The idea of opening the Great Lakes to ocean-going vessels had blossomed and withered many times in the history of the inland seas. As early as 1848, it was possible for small schooners to make the transition from the Atlantic Ocean to the Great Lakes through locks on the St. Lawrence River and the Welland Canal. In the 1850s trans-Atlantic voyages to and from lake cities were an annual, if not a regular, feature. In 1856 the cooperative venture of Chicago and Montreal merchants with Cleveland shipbuilders resulted in sending the brand new 140-foot schooner, *Dean Richmond*, to Liverpool with a

282 Doug Bukowski, "Chicago's Other U-boat," *Chicago Tribune*, 28 January 1998.

283 "Marine Field Out of Red Ink," *Marine Review*, Vol. 52, No. 10, (October 1922), p.408.

284 Jason Henderson, Brent Gloy and Michael Boehlje, "Agriculture's Boom-Bust Cycles: Is This Time Different?" *Economic Review, Kansas City Federal Reserve* (Fourth Quarter, 2011) p.84-85; *Iron Age*, Vol. 109, No. 5, (February 1922) p.330.

cargo of grain. The next year Liverpool reciprocated the trans-Atlantic crossing by sending the *Madeira Pet* on its eighty-day voyage to Chicago. In the mid-1860s Norwegian immigrant ships brought new settlers from the fjords to Lake Michigan. But in the post-Civil War era as ship size increased both on the oceans and the lakes such trips dwindled. The small size of the ships that could navigate the St. Lawrence locks simply could not justify the cost of an ocean transit. In 1887 the Canadian government updated the Welland Canal to a fourteen-foot depth and 270-foot length, but the upgrade came just as Great Lake ship size was increasing, and the best ships on the inland sea could not use the waterway. On the eve of World War I, the Canadian government commissioned yet another attempt to enlarge the Welland Canal. At the same time U.S. interest in an effective lake-to-ocean connection was high. In 1913 the United States Senate voted unanimously to support negotiations to develop with Canada a cooperative plan. The idea was to build commercially-viable locks on the St. Lawrence River, and at the same time develop the river's hydro-electric potential. President Woodrow Wilson supported the initiative. Unfortunately, budget issues caused Canada to balk, and when the Dominion was drawn into war with Germany, the opportunity for action vanished.²⁸⁵

When the project was revisited in the 1920s, the two nations had a legacy of cooperation on which to build. Since 1909 they had the International Joint Commission that had been set up to resolve any issues that arose from disputes over water resources shared by both nations. The Great Lakes-St. Lawrence passage was the most important of those shared waters, and the Joint Commission's formal conferences every two years became a forum in which to promote cooperation on waterway improvement. Military planners also had before them the ridiculous spectacle of World War I when scores of Great Lakes ships had to be cut in half in order for them to be put into service on the Atlantic. There also were, however, powerful forces in both countries aligned against a lake to ocean waterway.

Plans for deep-water access through the St. Lawrence reopened the rivalry between New York and Montreal that went back to the French and Indian Wars. Montreal was located on the St. Lawrence, the natural outlet of the Great Lakes, yet New York's Erie Canal had diverted the bulk of the lake commerce to the Hudson River route to the sea. New York would not sit back and watch the Canadians secure Uncle Sam's help at their expense. Another old rivalry was reopened by the St. Lawrence plans. Mississippi River ports wanted federal support for improvements, and they gained an important ally in Chicago, at that point still one of the most important ports on the Great Lakes. In 1900 Chicago had opened the Sanitary and Ship Canal, which offered improved transportation between Lake Michigan and the Illinois River. The city's goal was to solve its sewage problem by using large amounts of Great Lakes water to flush its filth down into the Mississippi River system. While St. Louis and other downstream communities were driven to futile lawsuits by this outrage, Great Lakes states and provinces were stunned by the scale of the diversion that actually lowered the level of the Lake Michigan-Lake Huron basins by several inches. Chicago used the enlarged canal to offer the

prospect of diverting the bulk of Lake Michigan's trade away from the Great Lakes and to Mississippi River interests in St. Louis and New Orleans. In 1906 a major convention was held at which was formed the Lakes-To-The-Gulf-Deep Waterways Association. This galvanized Southern and Middle Border opposition to a St. Lawrence deep-water project. There were also significant opposition groups in Canada with the Prairie Provinces preferring to see government investment in the Hudson Bay Railroad as a better way for them to reach Atlantic markets, while the Maritime Provinces saw the seaway as a plan to bypass their ports. On top of that there was reoccurring interest in an all-Canadian or all-American waterway that could be pursued unilaterally by either country.²⁸⁶

In spite of these opponents, the logic of an improved waterway from the heartland to the tidewater had won wide support in the United States. The election to the presidency of Herbert Hoover in 1928 seemed to be the turning point. He had been a long-time supporter of the project, and his administration entreated Canada to commit to a joint project. Negotiations on a treaty, however, dragged on until 1932, which coincided with both a presidential election and a deepening of the Great Depression. A Great Lakes Waterway Treaty was finally signed, but its ratification was placed on the back-burner by the new Franklin Roosevelt administration that was committed to fight the Depression. The treaty also had a provision that proved to be a poison pill. The agreement contained clauses that limited the amount of water that could be diverted by Chicago for its Sanitary and Ship Canal. This was opposed by Illinois Congressmen and U.S. Senators responsive to Mississippi navigation, which benefited from the extra water taken by Chicago. When finally put to a vote, the treaty failed to garner the necessary two-thirds approval for passage. Canada never even submitted the treaty to Parliament for approval.²⁸⁷

One person neither surprised nor dismayed by the failure of the treaty was the new president, Franklin D. Roosevelt. He regarded the treaty as flawed but its goal laudable. "Just as sure as God made little green apples," he remarked, a St. Lawrence Seaway would be built and within days of the Senate vote, he had the State Department back working on a new treaty. On Roosevelt's watch, however, water-power development at Niagara and on the St. Lawrence became as important as a deep-water shipping channel. The native New Yorker understood the Empire State's appetite for electricity and how important it was for industrial growth. It took until 1938 for diplomats from both countries to hammer out a new treaty, but no action was taken on it because of Canadian Prime Minister William Mackenzie King's unwillingness to confront domestic opponents of the project.²⁸⁸

The outbreak of the Second World War in 1939 reanimated Canadian interest in the project, and personal consultations between the Prime Minister and the President led to the signing of a Canadian-American executive agreement in 1941. The United States Congress, however, refused to affirm the deal as sectional opposition once more asserted itself. This setback put further consideration of a

286 Stagg, *The Golden Dream*, 115; *Report of the Second Annual Convention of the Lakes-To-The-Gulf Deep Waterways Association* (St. Louis: Lakes-To-The-Gulf Deep Waterways Association, 1907), 63, 119.

287 Daniel Macfarlane, *To the Heart of the Continent: Canada and Negotiation of the St. Lawrence Seaway and Power Project, 1921-1954*, (PhD Dissertation, University of Ottawa, 2010), 80-87.

288 William R. Willoughby, *The St. Lawrence Waterway: A Study in Politics and Diplomacy* (Madison: University of Wisconsin Press, 1961), 160-80.

Great Lakes-St. Lawrence construction project on the back burner for the duration of the war. There was one concrete result for Great Lakes navigation. The 1941 agreement had called for the United States to build a new larger and deeper lock at Sault Ste. Marie. In the wake of the Pearl Harbor attack, Congress approved the project, and by July 1943 the MacArthur lock was busy with ore boats bound for bustling defense plants.²⁸⁹

Navigational Aid Improvements between the Wars

The twenty-one years between the First and Second World Wars saw important technological and organizational improvements in the management of inland seas navigation. The resulting increase in marine safety was in part because the war sped the adoption of existing technologies, such as electricity for direction finding and illumination. It was also in part because of the stimulus military emergency often gives to technological innovation. An example of both of these was the adoption of radio beacons by lake vessels and lighthouses. As early as 1899 Guglielmo Marconi, the inventor of wireless telegraphy, described how radio waves could be broadcast by “lighthouses and lightships, so as to enable vessels in foggy weather to locate dangerous points around the coasts.” The United States Navy conducted experiments with radio beacons during World War I. The Bureau of Standards and the Lighthouse Service paid close attention to this work, and by the early 1920s radio towers were installed at several Atlantic stations. In 1920 the U.S. Lake Survey assisted the Navy in choosing the location for a series of radio beacon stations on lakes Superior, Michigan, and Huron. In 1925 the first radio beacon was placed on the Great Lakes lightship, the *LV Huron*, stationed at Gray’s Reef in Lake Michigan. The U.S. system was simple and reliable. A transmitter was installed on a lightship or lighthouse, and it sent a simple Morse code signal unique to its location. A vessel equipped with a radio compass could receive the signal and determine its position vis-à-vis the light station. By registering the direction of other beacons, a navigator could, by triangulation, accurately plot a vessel’s exact position. The radio beacon also allowed light keepers to aid ships equipped with radio direction finders (RDF) miles from the sound of a fog horn or the sight of a light. Fog-bound vessels near a station could get an even better fix on their position when the radio beacon sent a signal at the same time a fog horn was sounded. A captain on the bridge of a ship could time the span between when the radio signal was received and when he heard the horn and calculate how far he was from the station.²⁹⁰

Tests on Lake Michigan in 1933 demonstrated the advantages of mobile radio navigation systems to aid late season navigation on the lakes. Car ferries between Michigan and Wisconsin often ran after the regular navigation season closed at the end of November. Low-powered radio beacons were installed on ten car ferries. Car ferries were an important part of lake traffic and several railroads

289 Daniel Macfarlane, “Caught Between Two Fires: The St. Lawrence Seaway and Power Project, Canadian-American Relations, and Linkage,” *International Journal* (Spring 2012), 65-482; Willoughby, *St. Lawrence Seaway*, 195.

290 F.W. Dunmore, “Radio Direction Finding as an Aid to Navigation,” *American Shipping*, Vol.15, No.2 (April 1922): 10-12, 16; Alan Renton, *Lost Sounds: The Story of Coast Fog Signals* (Caithness, Scotland: Whittles Publishing, 2001), 129-31; John W. Kean, “New Lighthouse Devices Safeguard Mariners,” *Popular Mechanics: An Illustrated Weekly Review of the Mechanical*, Vol. 36, No.1 (July 1921): 60-61; *News-Palladium* (Benton Harbor, Michigan), 18 March 1933; Dempster and Berger, *Lighthouses of the Great Lakes*, 104-07; Hyde, *The Northern Lights: Lighthouses of the Upper Great Lakes*, 44.

operated these boats to transfer railroad cars across the lake and thus avoid the rail bottleneck at Chicago caused by the need of east-west rail tracks to dip below the southern extension of Lake Michigan. The experimental system allowed the vessels to make radio bearings on each other and thus avoid collisions. The captain of the Pere Marquette Railroad's ferry *P.M. 22* reported that:

On December 19 when on route to Manitowoc, with strong west winds and winter fog so heavy I could not see the water from the bridge, I picked up a mobile radio signal of *P.M. 21* (a sister ship) nearly ahead. She was coming from Manitowoc. I ported one point. The bearings of the radio compass constantly changed until I had *21* abreast of me. We probably passed within a mile of each other. We did not see or hear her, but we knew by the bearings that we were going clear and also when we passed her. I consider it a perfect demonstration of the value of the mobile radio beacon.

Putnam was a firm believer in the efficacy of this new technology, and he budgeted for it to be widely employed. He examined the number of ship groundings on the Great Lakes in the four years that preceded the installation of radio beacons and the four years that followed. He estimated a 50 percent decrease in stranded vessels. By 1942 there were fifty-eight radio beacons in service on the American side of the lakes and seven operated by the Dominion of Canada. Although the United States and Canada drafted regulations for radio communication and navigation as early as 1938, it was not until 1954 that rules requiring radios on all commercial vessels were finally enacted. Beacons and radio direction finders were a popular, low-cost, electronic aid to navigation, and their use continued for the rest of the twentieth-century. As late as 1991, there were nearly 700 thousand units still in use.²⁹¹

Radio beacons were a product of electricity. The potential of electrical currents had been known and studied for centuries. The true power of electricity to produce a new industrial revolution was realized and enacted in the late nineteenth century. It was not, however, until the 1920s and reliable power grids had been laid out that lighthouse electrification became widespread. As early as 1886 the Lighthouse Board had experimented with electricity when it installed arc lights in the Statue of Liberty. In the late 1880s and into the 1890s, incandescent electric lamps were experimented with at several Atlantic stations. The Navesink Lighthouse on the Jersey shore was electrified in 1898, but it required its own independent generator. In 1913 *LV 97*, anchored off the Virginia coast, successfully operated its electric light from a battery system. One of the first Great Lakes lighthouses to use electricity was the breakwater light and fog signal at Ashland, Wisconsin. Installed in October 1915, the fourth-order lens was lit by a 1,600 candle-powered bulb and powered by the Ashland city power grid through a two-mile-long underwater cable. It was not until 1924 that the Grosse Point Lighthouse in Evanston, Illinois, and the Wind Point Lighthouse near Racine, Wisconsin, were electrified. However, electricity gradually spread to the other Great Lakes stations during the 1920s, and it became a revolution in the 1930s.²⁹²

The move to incandescent lights and electrical power had a major impact on the men and women

²⁹¹ Woodford, *Charting the Inland Seas*, 117; Putnam, *Sentinels on the Coasts*, 213-15; O'Brien, *Guardians of the Eighth Sea*, 69 ; "Title 47, Telephones, Telegraphs, and Radio Telegraphs," *United States Code, 2000*, (Washington, D.C.: U.S. Government Printing Office, 2001), 29; United States Coast Guard, *LORAN-C User Handbook* (Washington, D.C.: United States Coast Guard, n.d.), 11.

²⁹² United States Light-House Board, *Annual Report of the Commissioners of Lighthouses of the United States to the Secretary of Commerce for the Year 1915* (Washington, D.C.: U.S. Government Printing Office, 1915), 87-89; Donald J. Terras, *The Grosse Point Lighthouse, Evanston, Illinois Landmark to Maritime History and Culture* (Evanston: Windy City Press, 1995), 89; Terry Pepper, "Wind Point Light, Racine, Wisconsin," *Seeing the Light*, <http://terrypepper.com/lights/michigan/windpoint/windpoint.htm>, accessed April 2015.

who manned Great Lakes stations. The new lights burned bright and clean without the smoke that had dirtied lenses and lantern room windows in the past. The daily task of cleaning and polishing the glass was tremendously reduced. Instead of lugging fuel up the steep steps of the tower each day, a keeper only had to flip a switch and the beacon was in service. Even this became redundant when light timers could be installed. As early as 1916 the Lighthouse Service experimented with an automated device that changed burned out bulbs. In 1921 a rotating fixture that contained three bulbs was tested at the Ashland breakwater light. When one bulb burned out, an electromagnet rotated a new bulb in place. Also given a trial was a small emergency generator that could be activated if the power grid failed. In 1928 Charles Wallace invented an improved automated bulb changer. By the 1930s his lamp changer was in wide use in American lighthouses. Stations once manned by four or five keepers were reduced to two and in some cases automation eliminated the keepers altogether. Those keepers who were kept had to be able to deal with increasingly sophisticated electrical equipment, something many old veterans of the oil lamps could not manage.²⁹³

The promise, or as some old timers saw it, the threat of automation was demonstrated in 1934 when *LV-75*, a lightship that dated from 1902, was converted to unmanned use. Anchored at the critical Lake St. Clair choke point, she was a key navigational aid in one of the world's busiest shipping channels, passed by 14,000 vessels annually. All of *LV-75*'s equipment was installed in duplicate so that if a device failed its function, it could be carried on by a replacement started by remote control from a land-based station at St. Clair Flats. Radio-telephone signals allowed the lightship's operations to be accurately monitored. An astronomical clock turned the beacon light on and off. The remote operator could override automatic systems when weather conditions such as fog so required. *LV-75* was an experiment, and while she clearly pointed the way to the future, she only remained on station until 1939. At that time, a permanent off-shore lighthouse was installed. Like the lightship the new St. Clair Light Station was unmanned and fully automated. Yet in spite of these successful early automations, manned stations were only phased out very gradually. The lighthouse service carefully tried to balance the cost of installing and maintaining new technology with the efficiency it promised. Nonetheless, by the mid-1930s George Putnam of the Lighthouse Establishment estimated that automated light stations had saved the United States more than \$1 million annually.²⁹⁴

Another new technology that was widely adopted between the wars was the radio-telephone. The Lake Carriers' Association and many vessel masters had successfully fought off federal efforts in the period before World War I to mandate wireless telegraphs on all Great Lakes commercial vessels. But during the 1920s the use of radio-telephones was perfected, and this offered a simplified and less costly method of effecting ship-to-shore communication. In 1922 the *Carl D. Bradley* of the Michigan Limestone and Chemical Company was equipped with a radio-telephone. At the limestone company's home

293 Terras, *Grosse Point Lighthouse*, 89; Kean, "New Lighthouse Devices Safeguard Mariners," *Popular Mechanics* (July 1921): 60-61.

294 Jerry Biggs, "Candles on the Water - Bluewater Belles: The Lightships Huron, St. Clair and their Sisters on the Lake," *Lighthouse Digest Archives* (September 1995). <http://www.lighthousedigest.com/Digest/StoryPage.cfm?StoryKey=304>, accessed April 2015; "Lake St. Clair," Lighthouse Friends, <http://www.lighthousefriends.com/light.asp?ID=705>, accessed April 2015, Putnam, *Sentinels of the Coasts*, 227.

base in Rogers City, Michigan, the Central Radio Telegraph Station had set up a broadcast operation just before World War I. The experiment went well enough that the following year the *B.F. Taylor* was also so equipped. The ship's equipment was installed by the Radio Corporation of America (RCA) and allowed the vessels to receive updated directions from the home office, weather reports, and occasionally music from a shore-based record player. This successful experiment was not quickly embraced. It was not until 1937 were there as many as two-hundred Great Lakes vessels that were capable of receiving and sending radio-telephone messages. The Pittsburgh Steamship Company, the largest commercial fleet on the Great Lakes, had all its vessels so equipped. That same year a formal weather forecast began to be broadcast from the government locks at Sault Ste. Marie.²⁹⁵

Another major step in improving Great Lakes navigation was made in 1922 when the *Daniel J. Morrell*, a steamer launched fourteen years before, was equipped with an electric-powered gyrocompass. Unlike traditional compasses that operated on the basis of magnetism, the new device was a mechanism that utilized gravity and inertia to point north. The gyrocompass was more accurate because it pointed to true north—the pole—not magnetic north, which was south and west of the North Pole. More important for Great Lakes navigators, the gyrocompass spared them having to account for deflections caused by the rich iron ore deposits in the Lake Superior basin or even from the iron in the hulls of their vessels. Lake vessels continued to carry



Figure 37. Gyrocompass on the USCG icebreaker Mackinac.

²⁹⁵ The *Carl D. Bradley* mentioned here was not the same as the ill-fated vessels that so famously sank in Lake Michigan in 1958. That vessel was not built until 1927. The original *Carl D. Bradley* was built in 1917 and was renamed when the newer larger steamer was launched. For wireless telegraphy at Rogers City see: *The Wireless Age: An Illustrated Monthly Magazine of Radio* (July 1922):53; Robert F. Crittenden, "WLF - WLC Central Radio Telegraph Company," 1947, http://www.imradioha.org/text/wlc_1947_article.txt, accessed April 2015; "Today Rogers City is a Center of a Live, Healthy, Progressive Community," *Calcite Screenings* (Special Edition, 1950), 16; Thompson, *Graveyard of the Great Lakes*, 341-42.

magnetic compasses, but the go-to source for directional orientation was hereafter the gyrocompass.²⁹⁶

The increased safety to lake vessels brought by this new technology was matched by continuing improvements via good old-fashioned civil engineering. While trade groups like the Lake Carriers' Association often dragged their feet on expensive new shipboard navigational aids, they were active in advocating for publicly funded improvements to harbors and channels. An important, if difficult, project championed by the ship owners was a widening of the Detroit River channel to create separate transit lanes for ships up bound and down bound. This proved a formidable undertaking. A coffer dam nearly six-thousand feet long was built across a shallow stretch of the river and a new twenty-one foot deep channel was blasted out of the granite bedrock. No sooner was the first phase of this undertaking completed in 1912 than the Lake Carriers' Association wanted to have the deep channel extended. The Association's prominent role in lobbying Congress for these projects was memorialized when the new channel was named the Livingston Channel after a president of the ship owners group. By 1928 the Army Corps had spent \$160 million on the project, which had become, in the words of one contemporary, "the largest and most expensive of any similar work ever undertaken by the United States within its boundaries." Further improvements were authorized in the 1930s with the effect of greatly improving safety and speed of ships on the river but at the cost of destroying the once thriving whitefish fishery in the river.²⁹⁷

A Changing of the Guard: The Demise of the Lighthouse Bureau

In 1935 George Rockwell Putnam, the chief of the United States Lighthouse Bureau, retired after twenty-five highly regarded years. He had successfully combined Stephen Pleasonton's cost-consciousness with the old Lighthouse Board's interest in technological efficiency and innovation. With nearly thirty-thousand aids to navigation, the United States operated the largest lighthouse service in the world. Yet while Putnam presided over a doubling of such aids, he managed to decrease the number of personnel in his agency by 20 percent. Under Putnam the nation had been in the forefront of lighthouse automation and international maritime cooperation. Yet less than five years after he left Washington the United States Lighthouse Service was no more.²⁹⁸

The change was sparked by President Franklin D. Roosevelt's desire to modernize the operations of the executive branch of the federal government. In the wake of his re-election in 1936, Roosevelt had embarked on a wholesale revision of how White House and Executive Department staff were organized and managed. The Reorganization Plan No. 1, the proposal he sent to Congress, would have located much more power in the hands of the president and weakened further political patronage. It caused considerable controversy and careful negotiation before being finally adopted. Reorganization Plan No. 2, on the other hand, breezed through Congress quickly, and it concerned the fate of the Lighthouse Service. The plan

²⁹⁶ Thompson, *Great Lakes Steamboats and Sailors*, 55-56.

²⁹⁷ David A. Bennion and Bruce Manny, *The Construction of Shipping Channels in the Detroit River: History and Environmental Consequences* (Reston, Virginia: U.S. Geological Survey and the U.S. Environmental Protection Agency, 2011), .5-6.

170 ²⁹⁸ Noble, *Lighthouses & Keepers*, p. 37.

abolished or shuffled a wide variety of government agencies from one cabinet department to another, from the Migratory Bird Commission, the Rural Electrification Administration, and the Bureau of Fisheries to the Lighthouse Bureau. The latter was ordered to become part of the United States Coast Guard. The Coast Guard was by far the larger entity with more than ten-thousand officers and men, while the Lighthouse service had just over four-thousand civilian employees (as well as 1,100 part-time workers) including a handful of women.²⁹⁹



Library of Congress, LC-DIG-det-4a23762

Figure 38. Livingston Channel, Detroit River, sometime between 1909 and 1915.

It has often been remarked that the merger marked the first time a civilian agency of the government had been taken over by an arm of the United States military. This, however, overlooks the earlier merger of the U.S. Life-Saving Service into the Coast Guard in 1915. Resentment of that shotgun marriage among the civilian life-savers was so strong and enduring that a serious attempt to divorce the agencies was made as late as 1934. Nor did the Lighthouse Service's entry into the Coast Guard proceed without making a few waves. Some lighthouse keepers were summarily fired by the Coast Guard Commandants of their districts. Most were given a choice of quitting, retiring if they were long-time veterans, or they could stay on as civilian lighthouse keepers. There also was the offer of enlistment in the Coast Guard. Experienced keepers, who were asked to stay, were brought in at the relatively high rank of petty officer. The establishment of a peace-time draft in September 1940 made enlistment in the Coast Guard an attractive option for a young lighthouse man leery of service in the army. Some lighthouse employees, particularly those who had large families at light stations, felt that the Coast Guard officers were arbitrary in their personnel decisions. For such employees, there was little recourse for appeal. The Lighthouse Commissioner Harold King was initially given the rank of captain and made an assistant to the Commandant of the Coast Guard, Rear Admiral Russell R. Waesche. In reality, King had little input on the transition, and he was out of the service altogether in a matter of months. Also out were most of the former lighthouse district inspectors. They were dry docked after a brief term as "assistants" to the Coast Guard division commanders. A decade after the merger, one former lighthouse man still complained about the Coast Guard's "brassy" officers, and he contended, perhaps a bit too harshly, that

²⁹⁹ Matthew J. Dickinson, *Bitter Harvest: FDR, Presidential Power and the Growth of the Presidential Branch* (New York: Cambridge University Press, 1996), p.86-93; Reorganization Plan No. II, 53 Statute, 76th Congress, 1st Session, 9 May 1939, p.1431.

“no good blood ever existed between either group.”³⁰⁰

A factor in the absorption of the Lighthouse Bureau by a branch of the military was the looming prospect of war. The official date of the merger was July 7, 1939. Fewer than sixty-days later Adolph Hitler's Germany invaded Poland and World War II began. The Roosevelt administration had been trying to build up the nation's defenses in spite of a Congress that was reluctant to take any action that might move the United States closer to another war in Europe. The merger was seen as way to increase the military budget without raising fears that it would facilitate aggressive action, since the Coast Guard had a major role in enforcing observance of the nation's neutrality laws. Even before the United States was formally at war, President Roosevelt on November 1, 1941, transferred the Coast Guard from its peace time home of the Treasury Department to the Navy Department. The business of navigation on the inland seas was once more a part of the enterprise of war.

World War II on the Inland Seas, 1941-1945

The role of American industry in the winning of the Second World War has rightly been dubbed a “production miracle.” At the time, it seemed all the more miraculous because it came on the heels of the Great Depression. The vast U.S. steel industry centered on the Great Lakes reached its pre-war production peak in 1929 with an output of some 63 million tons. Yet by 1932, the Depression's low point, the industry was limping along at a mere twenty-percent of capacity. Nearly half of the inland seas fleet of 405 ore carriers never even left port that year; scores of vessels that did, only made one or two runs before being shut down for the year. As late as 1938 the steel industry could not reach half of what it produced in the years before the Great Crash. World War II's impact on industry, in the words of the economic historian Hugh Rockoff, “was the obverse of the Great Depression.” Only a year after the war started in Europe, the somnolent steel industry had awoken and forged 81 million tons, by the end of the conflict in 1945, U.S. furnaces were producing 96 million tons.³⁰¹

The lake marine that emerged from the Great Depression was significantly changed from the one that had thrived in the decades of the 1910s and 1920s. When the U.S. economy roared in the twenties, as many as 350 companies operated commercial vessels on the inland seas. Hard times had the effect of drastically winnowing the competition. A premium was placed on efficiency, and many small operators whose fleets were composed of smaller, older vessels found themselves at a significant disadvantage when trying to secure shipping contracts. The larger, well-capitalized firms had been able to invest in newer large vessels, some six-hundred feet in length, and equipped with a large boom that enabled them to unload their bulk cargo without any shore-based equipment. Although such vessels were rare in the pre-war lake marine, they pointed the way to the future. Self-unloaders could arrive in a port at night,

300 Timothy Harrison, “The Last Days of the Lighthouse Commissioner,” *Lighthouse Digest Archive*, (Jan/Feb, 2012), <http://www.lighthousedigest.com/Digest/StoryPage.cfm?StoryKey=3631>, accessed April 2015; Robert E. Johnson, *Guardians of the Sea: A History of the United States Coast Guard 1915 to the Present* (Annapolis: Naval Institute Press, 1987), p.162-65.

301 Hugh Rockoff, “The United States: From Ploughshares to Swords,” *The Economics of World War II: Six Great Powers in International Comparison*, ed. by Mark Harrison (New York: Cambridge University Press, 1998), p.81-121; George J. Joachim, *The Iron Ships: The Great Lakes in World War II* (Detroit: Wayne State University Press, 1994), p.10.

discharge their cargo, and be underway again by dawn. Gradually, more and more of the lake fleet were owned by fewer and fewer mammoth corporations. By the late 1930s these tended to be the vertically-integrated steel companies that consolidated control over mines, railroads, shipping lines, and steel plants. On the American side of the lake, a mere twenty-one companies operated 308 vessels engaged in the iron ore trade. The U.S. Steel Corporation's Pittsburgh Steamship Company, not surprisingly, was the largest lake fleet with seventy-five vessels in operation. As the Depression's cold grip on the economy loosened and the prospect of war heated investment, the industrial giant launched four new giant bulk carriers in anticipation of the busy times ahead.³⁰²

The impact of war on heavy industry in the United States was immediate and unmistakable. America's gross national product doubled in the last quarter of 1939 as car and truck makers increased their production goals by over a million units. Suddenly, every steel producer wanted to increase their inventory of ore, limestone, and coal in anticipation of a busy winter in the manufacturing sector. Mothballed vessels were hastily refitted and dispatched to the Lake Superior mines to bring back as much of the red rock as possible before December's ice and storms closed navigation for the year.

In December 1940 President Franklin D. Roosevelt devoted his weekly "fire-side chat" to the issue of defense preparedness. "We must be the great arsenal of democracy," he declared. "For us this is an emergency as serious as war itself." Two months later those words were transformed into action when the President signed an emergency naval appropriation of nearly \$1 billion. The navy needed new vessels and ship yards on the seaboard as well as on the lakes were soon bustling with construction contracts. For years, the Rush-Bagot Agreement, made in the wake of the War of 1812, had limited both Canada's and the United States' ability to build and operate military vessels on the Great Lakes. With the British Empire locked in an existential struggle and the United States preparing to join the conflict, there was no trouble in getting that treaty's limitations suspended. The immediate need was for anti-submarine vessels to help keep convoys of Atlantic merchant ships safe from U-boat attack. Orders for sixty-six submarine chasers went to Great Lakes yards in 1941 as well as for numerous mine sweepers and patrol boats.³⁰³

Following the Japanese attack on Pearl Harbor in December of 1941, the Great Lakes were fully mobilized for war. The first step toward victory over both Japan and Germany was to secure naval control over the sea lanes connecting the United States with its overseas allies. In 1942 the allies lost over one-thousand ships to U-boat attack. Between the Germans, Italians, and Japanese 8.3 million tons of shipping was sent to the bottom of the world's oceans. The need to replace these losses strained U.S. shipyards. It was now that the folly of the Canadian and U.S. governments to build a modern waterway via the St. Lawrence and Great Lakes was painfully realized. The size of the Welland and St. Lawrence locks once again limited what types of vessels could be built on the inland seas. In desperation, the federal War Shipping Administration requisitioned twenty small Great Lakes freighters for ocean service. In

³⁰² Joachim, *Iron Fleet*, 18-20; Al Miller, *Tin Stackers: A History of the Pittsburgh Steamship Company* (Detroit: Wayne State University Press, 1999), 131.

³⁰³ Joachim, *The Iron Fleet*, 34-36.



Figure 39. USS Robalo ready to be launched in Manitowoc, Wisconsin, 1943.

July 1942 fourteen passenger-packet vessels used for excursions, and the transport of miscellaneous cargoes were removed from the lakes for Atlantic duty. Creativity was required to take full advantage of the Great Lakes region's skilled labor force and its proximity to steel production. Vessels too large for the Canadian locks were sent to the Gulf Coast via the Illinois-Mississippi Waterway. This allowed the Manitowoc Shipbuilding Company to execute contracts for twenty-eight 311-foot submarines. Bay City, Michigan's Defoe Shipbuilding Company contracted to build twenty-eight 307-foot destroyer escorts. Shipyards in Minnesota and Illinois contributed frigates, mine sweepers, cargo vessels, some up to 340 feet in size, as well as a complete assortment of landing craft from the 400-foot LST (Landing Ship Tank) to the small LCVP (Landing Craft Vehicle, Personnel). Even Chris-Craft of Michigan, famous for their elegant pleasure boats, joined in the effort and devoted production to military contracts. The New Deal's investments in new locks and dams along the Illinois-Mississippi Rivers in the 1930s proved to be a bonus to national security.³⁰⁴

³⁰⁴ Thomas B. Buell, John H. Bradley, Clifton R. Franks, *The Second World War: Europe and the Mediterranean* (Garden City Park, NY: West Point Military Series, 2002), 221; Joachim, *The Iron Fleet*, 52-55; Thomas P. Ostrom, *The United States Coast Guard in World War II: A History of Domestic and Overseas Action* (Jefferson, NC: McFarland & Company, 2009), 56-59.



Figure 40. Aircraft carriers USS Wolverine and USS Sable docked near Navy Pier, Chicago.

Of all the Great Lakes, it was Lake Michigan that was most affected by the emergency measures of the world war. Large portions of the lake were closed off from civilian use for military exercises. The submarines coming off the slips at Manitowoc had to be tested, sailors at the Great Lakes Naval Training Station north of Chicago had to be trained, but most disruptive of all was the operation of two aircraft carriers on the lake during the war. World War II, at sea, was won by aircraft carriers and specifically the pilots of the United States Navy. During the war, the U.S. was able to train sixty-five-thousand naval aviators. While not all were destined for aircraft carrier duty, of those who were, 17,820 were trained on Lake Michigan's aircraft carriers. In addition better than 22,000 flight deck crew members were trained on the lake. The idea of establishing a carrier force on the inland seas is generally credited to Commander Richard Whitehead of the Great Lakes Naval Training Station. Even before Pearl Harbor he suggested that a Great Lakes vessel be refitted to serve as a training carrier. He was aware of the danger submarines posed to capital ships even in home waters, save, of course, for the Great Lakes. It was not until March 1942 that action was taken and two side-wheel powered excursion vessels, the *Seeandbee* and the *Greater Buffalo*, were converted into the *USS Wolverine* and the *USS Sable*. By September the *Wolverine* had successfully trained its first pilot.³⁰⁵

Pilots attempted to qualify for carrier duty only after months of classroom instruction and flight training at terrestrial airfields. After that came the challenge to succeed in making ten (later eight) carrier landings and thus be awarded the wings of a naval aviator. Take-offs from the converted carriers could be tricky. The *Wolverine* and *Sable* had flight decks only twenty-six feet above the water, much lower than the big fleet carriers, so when planes took-off and dipped as they cleared the deck, pilots had

³⁰⁵ Matt Portz, "Aviation Training and Expansion," *Naval Aviation News* (July/August 1990): 22-27.

to be careful not to sink right on the waves. The danger of carrier landings for inexperienced pilots is amply demonstrated by the existence of more than 250 World War II era warplanes on the bottom of the lake. Most novices who splashed were quickly rescued, but twenty-one young men lost their lives. Winter flights were particularly risky due to the harsh weather. Because of the danger of crashing into the lake was so great, pilots were required to keep their cockpit canopy open so that if they hit the water they would have an easier time getting out of the sinking plane. The weather made a strong impression on Lieutenant Junior Grade George H.W. Bush, who later would pilot a torpedo plane in the Pacific and become President of the United States. "I remember those Great Lakes flights very well in the open cockpit that winter. Coldest I ever was in my life." An unfortunate part of pilot training was the beating taken by the remote Waugoshance Light which had been deactivated in 1912 when the main shipping channel shifted to the west. The Navy decided to make use of the surplus government property by making it a target for pilots trying to perfect strafing techniques. The keeper's house was completely destroyed and the steel casing of the tower was partly ripped away. The isolated and forlorn tower is considered by historic preservationists today the most endangered American lighthouse.³⁰⁶

The major security concern on the Great Lakes was the locks of the Sault Ste. Marie Canal. That waterway was the principal outlet for the strategic iron ore deposits in northern Michigan and Minnesota. Getting shiploads of that commodity to the steel mills along the lower lakes was crucial to the United States' ability to function as an "arsenal of Democracy." Early in the war, the Board of the Lake Carriers' Association petitioned the Secretary of War to protect the vital choke point from enemy sabotage. When the vulnerability of the canal was finally investigated by the military, there was an over-reaction. Among the scenarios that emerged from an army assessment was the fear of a German U-boat bringing a dive bomber into Hudson's Bay and from there launching an assault on the locks. Another outlined the possibility of a paratrooper attack on Sault Ste. Marie. As a result, in March of 1942 the War Department hurried the 100th Coast Artillery to northern Michigan. They were joined there by the 131st Infantry Regiment and 399th Barrage Balloon Battalion as well as anti-aircraft units. Army engineers began construction of air fields for fighter squadrons to protect the locks from the air. After a year of war, however, a more sober assessment of risk reduced the force guarding Sault Ste. Marie to a military police battalion.³⁰⁷

Security was again a major concern on the Upper Great Lakes when President Roosevelt elected to take a fishing trip to Lake Huron in August of 1943. Roosevelt had loved a summer break to fish and sail in the Bay of Fundy near his family retreat at Campobello Island, but the danger of German U-boat attack made that impractical in time of war. Instead, it was suggested that the islands and coves of Georgian Bay might prove a worthy substitute. The president brought with him a number of his most important military and civilian advisers, including Chief of Staff Admiral William D. Leahy, military

306 Theodore J. Karamanski and Deane Tank, *Maritime Chicago* (Chicago: Arcadia Press, 2000), 80-85.

307 Rachel North, "When the Soo Locks Readied for World War II," *Traverse, Northern Michigan Magazine* (March 2012), available at, MyNorth, <http://mynorth.com/2014/02/northern-michigan-history-when-the-soo-locks-readied-for-world-war-ii/>, accessed June 2015.

advisors Admiral Wilson Brown, Vice Admiral Ross McIntire, Major General Edwin Watson, James Byrnes, who headed the Office of War Mobilization, and Special Assistant Harry Hopkins. Between meetings regarding planning for the upcoming Quebec Conference with Winston Churchill and fishing excursions, Roosevelt was able to relax. The gun boat *USS Wilmette* was sent up from Lake Michigan to protect the party and to facilitate their fishing sorties. It did not seem to occur to any of the planners how inappropriate the *Wilmette* might be for that task. The ship had previously been known as the *Eastland*, and in 1915 she capsized in the Chicago River killing 844 passengers in the worst disaster in Great Lakes history, hardly a recommendation for a presidential escort. The only security scare, however, came from another source. A German Prisoner-of-War escaped from the Gravenhurst, Ontario, internment camp, and was rumored to be moving in the direction of the presidential party. However, Canadian police picked up the Luftwaffe Oberleutnant as he tried to board a train. Hans Peter Krug was the closest the Nazi's ever came to the Sault Ste. Marie locks.³⁰⁸

That waterway was never busier than during World War II. The nation's political and military leaders, however, were keenly aware of how utterly dependent the war economy was on the operation of the locks there. As early as December 1940 President Roosevelt ordered a study of a plan to construct an "overland ship railway." This hare-brained idea proposed to winch fully loaded ore freighters onto a special railway that would transport them around the twenty-foot differential between Lake Superior and the St. Mary's River. Sober analysis killed that idea, but it led to a plan to add a new lock to the existing two modern chambers that were already in use. The demand for a new lock was based on two considerations. A new facility could be made deeper than the other locks. A deeper lock would suit wartime demands by allowing ships to carry more iron ore in their holds thereby delivering more each trip. A new lock would also help to ensure against any accidents or sabotage that might disrupt the existing canal structures. Congress approved the project in February 1942 and in short order more than one-thousand workers were put to the task of building the lock. By July 1943 the facility was in operation. Named the MacArthur Lock, it played an important role in the lake marine's World War II performance.³⁰⁹

During World War II, a half a billion tons of iron ore was torn from the Lake Superior ranges and hauled to mills along the lower lakes. Ore freighters were virtually in constant motion during the conflict. Ship-to-shore radios, so long opposed by the Lake Carriers' Association, were employed to minimize any delays. Dispatchers monitored docking facilities and could redirect approaching vessels to ports prepared to accept immediate delivery. Throughout the war, the age-old battle with Mother Nature continued on the Great Lakes. Spurred by the heavy war production demands, shippers tried to push the start of the navigation season. In peacetime that meant April, but throughout the war attempts were made to begin shipping in March. In 1942 mild weather allowed the ore carriers to cast-off on March

³⁰⁸ Graeme S. Mount, "Myths and Realities: FDR's 1943 Vacation on Lake Huron, 1-7 August 1943," *The Northern Mariner/Le Marin du Nord*, XI, No. 3 (July 2001): 23 -32.

³⁰⁹ Joachim, *The Iron Fleet*, 92-95.

23rd. Unfortunately, a cold snap in early April led to a near disaster on Lake Superior. An ice blockage formed on Whitefish Bay and 120 vessels were stuck in a limbo between ice and a dangerous lee shore. It took weeks to restore the normal flow of vessels through the locks. Ice breaking became an increasingly important task for the Coast Guard. The service employed its cutters and tenders to the task as well as tug boats. The best ice breakers available from 1940 to 1944 were actually car ferries chartered by the Coast Guard. These unimpressive looking vessels were designed to carry rail cars across open water stretches such as the Straits of Mackinac all year round. The best of these, such as the *Chief Wawatam* of the Mackinac Transportation Company, had spoon-shaped bows and three propellers (two aft and one in the bow) that allowed them to break through ice barriers. It was not until the fall of 1944 that a purpose-built ice-breaker, the *Mackinaw*, was available to the Coast Guard.³¹⁰

World War II saw a significant upgrading of freighters in the Great Lakes fleet. Vessels taken off the lakes and on to the ocean tended to be older, either obsolete packet-passenger ships or hulls laid down by the Maritime Commission in World War I. In September 1941, the U.S. Maritime Commission proposed to subsidize the construction of new ore carriers. The Office of Production Management had predicted there would not be enough ships available to meet the war-time demand for iron ore. Within a month, the Commission had contracted with two shipbuilding firms to produce sixteen new 604-foot ore carriers. When the ships were launched, they were purchased by private lake carriers and put into service. At the same time, the government ensured the industry would not be stuck with excess capacity after the war by buying thirty-six older vessels, most of which were forty-years old, from the companies and then leasing them back until the end of the war, when they would be scrapped.³¹¹

Great Lakes shipping was fundamental to U.S. military production during World War II. Detroit and Chicago led all American industrial centers in the value of war goods produced, topping \$24 billion. Detroit-based Ford and Chrysler corporations between them produced more than a million trucks and tanks. Ford and Toledo-based Willys Overland factories churned out 647,343 jeeps for the military. Soviet, British, Canadian, Polish, as well as U.S. troops rode to victory on vehicles produced in the Great Lakes region and made from Lake Superior iron processed in foundries on Lake Michigan and Lake Erie. From Duluth to Buffalo factories built the engines, ordinance, and chassis that made mechanized warfare possible. Generations of public investment in lighthouses, buoys, charts, canals, locks, and radio beacons allowed the Great Lakes to function as a virtual conveyor belt moving the bulk raw materials that could be made into the shield and then sword of the nation.³¹²

310 Waring G. Smith, "Running the Ice Blockade," *Popular Mechanics* (April 1943): 50-53, 173-74; George W. Hilton, *Great Lakes Car Ferries* (Davenport: Montevallo Historical Press, 2003), 29

311 Joachim, *The Iron Fleet*, 102-6.

312 Perry R. Duis, "World War II," *Encyclopedia of Chicago*, edited by James Grossman, Ann Durkin Keating, and Jan Reiff (Chicago: University of Chicago Press, 2004), 897; Charles K. Hyde, *Arsenal of Democracy: The American Automobile Industry in World War II* (Detroit: Wayne State University Press, 2013), 152-54.

CHAPTER 7

May Their Lights Continue to Shine 1946-2000

In 1995 the United States Coast Guard put the Marblehead Lighthouse and sixteen other stations up for sale. The Marblehead sale in particular set off a wave of concern across the Great Lakes region. Built in 1821 on a point jutting into Lake Erie's Sandusky Bay, the Marblehead Light was the oldest on the inland seas. Cost cutting prompted the Coast Guard to privatize ownership of this and many other lighthouses as a way to transfer the maintenance and upkeep of the aged and exposed structure. To people who lived near the light towers as well as the many thousands of maritime enthusiasts in the region, it seemed that privatization was the first step to extinguishing the lights altogether. While it was true that modern satellite systems were on their way to being the state-of-the-art in navigational aids, lighthouses were still treasured by the American people. To Dick Moehl of the Great Lakes Lighthouse Keepers Association, the lighthouses along the continent's waterways were to North America what castles are to Europe, scenic, romantic reminders of our relationship with the past.³¹³

Inspired by that notion, Great Lakes folk singer and historian Lee Murdock penned a salute to the lighthouses of the inland seas. Titled "Deep Blue Horizon" the ballad is narrated from the perspective of the Marblehead Lighthouse recalling all the ships it has seen pass by its light in its more than one hundred years of standing guard on Lake Erie's shores:

I've seen the tall ships that have passed by the shore, the side wheeled steamers, the whale backs and more, the passenger packets, the south bound loaders, and even those noisy cigarette boaters, but all that I ask is don't let me go blind, let my light continue to shine.

Murdock captured a growing sentiment among the people of the Great Lakes region. For many, lighthouses had become landmarks in more than a navigational sense. They were symbols of a people's relationship with the lakes, a reminder of a heritage inspired by the thousands of men and women who lived and died upon their waters. As the twentieth century drew to a close the sweep of a lighthouse beacon became less important to those in peril upon the water and more significant to those who lived upon the land.³¹⁴

Post-War Navigational Advances

The end of World War II saw a major improvement in the safe navigation of the Great Lakes when the veil of secrecy was lifted on the technological improvements made by the Allies during the war.

³¹³ Lee Murdock, "Liner Notes," *Voices across the Water* (Kaneville, IL: Lee Murdock, 1997); *Isthmus*, (Madison, WI), 1-7 August 1996.

³¹⁴ Murdock, "Deep Blue Horizon," *Voices Across the Water* (Kaneville, IL: Lee Murdock, 1997).

Ship-to-shore radio was fully embraced by 1945 after the Lake Carriers' Association finally gave up their resistance to government safety mandates. Now the ship owners association boasted that the lakes had the largest and most integrated system of non-military radio communication in the world. The Great Lakes had 580 vessels connected to seventy-five Coast Guard stations, fourteen commercial stations, fifty-seven radio beacons, and five weather bureau stations. However, the new technology the Lake Carriers' Association was most interested in was radar. As early as the summer of 1944 the Lake Carriers' Association had a committee studying radar systems with an eye for developing a system suited for the closed waters of the inland seas. That same year the U.S. Coast Guard deployed the first radar-equipped vessel on the lakes when its new ice-breaker cutter, the *Mackinaw*, was launched. Despite early interest by commercial shippers, the private sector proceeded cautiously ever mindful of the cost involved in buying and operating sophisticated equipment.³¹⁵

It was not until 1946 that a series of tests were conducted of the various civilian radar systems available. Indeed, there was stiff competition between electronics companies for the Association's imprimatur. Six different radar systems were put through their paces. Some of the nation's leading companies, including Western Electric, General Electric, Westinghouse, Sperry, and Raytheon, sought to prove their systems. A year later the Lake Carriers' Association announced something the United States Navy already knew that radar was destined to become "not only an important safety device but a major instrument for navigation." During the test period, no one radar system seems to have gained an upper hand. Certainly the Western Electric radar designed by Bell Labs received the most press attention when it was installed on the S.S. *John T. Hutchinson* with the aid of an attractive Buffalo, New York, woman who won the contest to be "Miss Radar of the Great Lakes." Raytheon, despite not having a "Miss Radar" of their own, likely sold more units. Cost was a factor, as always, with units varying between \$7,000 and \$12,000 depending upon range and sensitivity.³¹⁶

Radar worked by bouncing a beam off objects in its path be it an island, another ship, or a lighthouse. The return signal was captured by a dish-like antenna and displayed on a cathode ray radarscope. While a few small shipping companies were deterred by the cost of equipment, installation, and training, most Great Lakes shippers grasped the savings that could be accrued by employing this new type of navigational aid. Radar gave ship captains the confidence to maintain their cruising speed in spite of weather events such as fog. Radar made night navigation in tight passages such as the St. Mary's River or the St. Clair Flats safer and faster. In a 1947 test of a radar system designed for the Great Lakes, a U.S. Navy hydrographer was impressed with the way radar not only warned of approaching vessels, it also indicated approaching squalls that with a slight change of course might be avoided. One shipping line estimated that the use of radar saved nearly forty hours of sailing time per month. Insurance costs were also lowered due to radar's ability to reduce the risk of both collision and groundings.

315 "Radar Sought for Lake Ships: Post War Hopes Told," *Milwaukee Journal*, 9 July 1944.

316 Larry Wolters, "Begin Testing of Radar on Lake Fraters [sic]" *Chicago Tribune*, 9 July 1947; "Collision Warning Radar, Western Electric Radar First on Great Lakes Fleet," National Museum of American History webpage, <http://scienceservice.si.edu/pages/103066.htm>, accessed June 2015; "Firm's Sale of 450 Units Shows Use of Radar in Navigation," *Chicago Tribune*, 4 April 1948.

The Pere Marquette Railway's car ferries were among the first fleets to fully adopt radar, gyro-compasses, and electronic direction finders. With these aids the fleet enjoyed an unbroken run of twenty straight years without a major accident. It is probable that no navigational aid from the first lighthouse up to the present made a more significant impact on marine safety than the installation of radar on Great Lakes vessels.³¹⁷

Radar and the ship-to-shore radio communication made Great Lakes navigation easier and safer, but not risk free. The post-war years saw a number of notable disasters that reminded mariners and shipping companies that the inland seas upon which they lived their lives were still a dangerous, even deadly element. This was especially true in the weeks before the shipping season closed when the "witch of November" haunted the lakes. In November 1958 the crew of the 639-foot *Carl D. Bradley* found this out when they were caught in a gale off Lake Michigan's Gull Island. With awful suddenness, heavy seas broke the vessel in half. Only two members of the crew of thirty-five survived. Lake Huron was the site

of a November gale that took the *Daniel J. Morrell* in November 1966. Seventy miles per hour winds

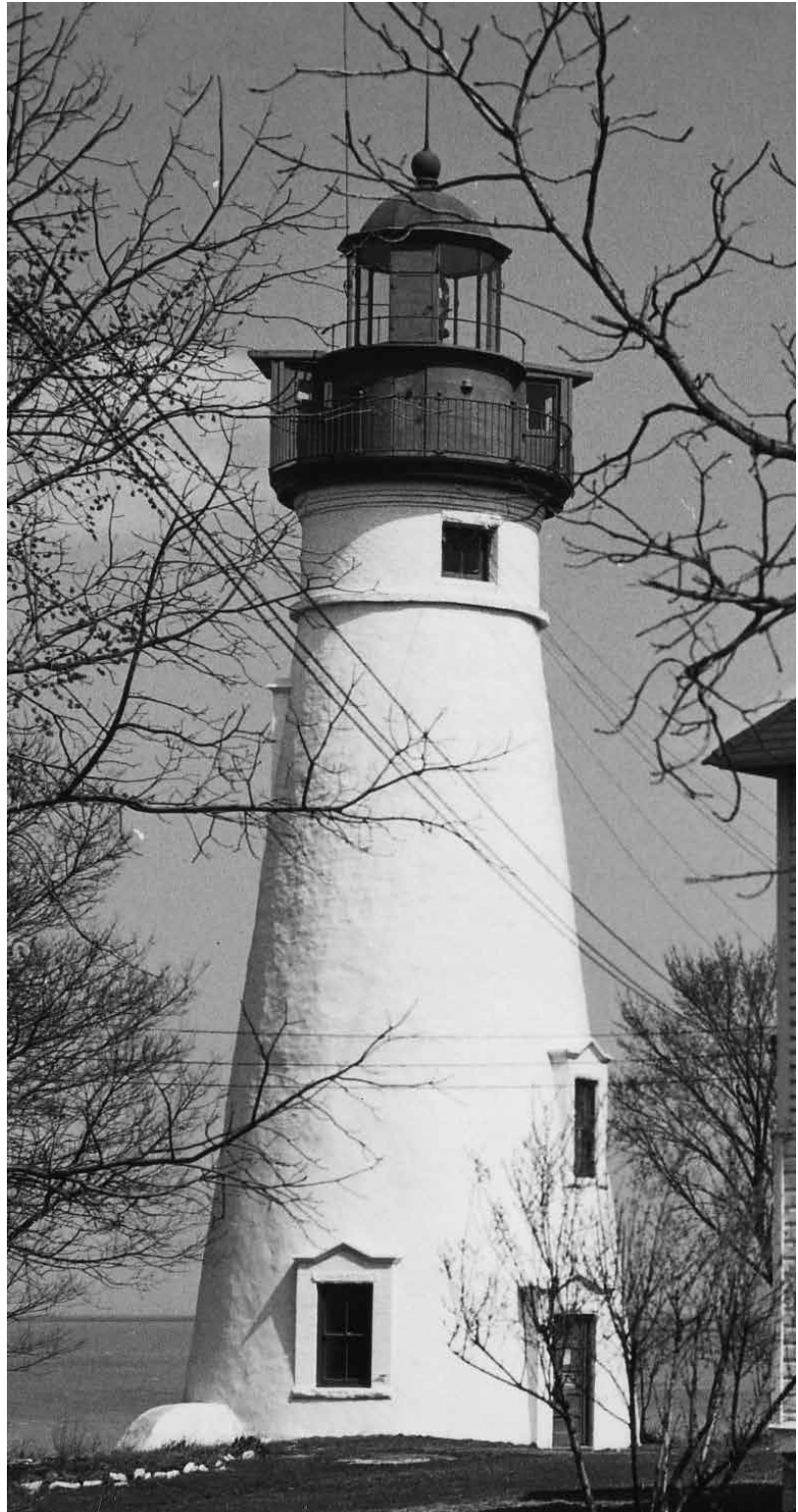


Figure 41. Marblehead Lighthouse, Lake Erie, 1936.

317 Larry Wolters, "Radar Value Demonstrated on Lake Ship," *Chicago Tribune*, 23 May 1947; Thompson, *Graveyard of the Great Lakes*, 75-76; George Woodman Hilton, *The Great Lakes Car Ferries* (Davenport, Iowa: Montevallo Press, 1962), 126.



Figure 42. Collision Warning Radar ca. 1949, Western Electric Radar First on Great Lakes Fleet.

and seas running twenty-five feet in height battered then broke apart the *Morrell* leaving only a single man on a frozen life raft to tell the story of her sorry end. Most famous of the November wrecks was the 1975 sinking of the *Edmund Fitzgerald*. Celebrated in art, literature, and especially in song, the *Fitz* was an example of the way improved maritime technology was still not enough of an edge when a major gale locked its jaws on a vessel. The *Edmund Fitzgerald's* ship-to-shore radio allowed it to receive updated weather forecasts and adjust its course accordingly. It had radar, although as the storm reached its peak wind and waves tore off the antenna and the screens went dark. Still, radio allowed the *Fitzgerald* to stay in contact with another storm-tossed vessel, the *Arthur Anderson*, which shared its radar readings. One

theory of the *Fitzgerald's* sinking points to a piece of technology the ship did not have. Fathometers indicate the depth of the water through which a ship was passing. The lack of this device would have been fatal if the ship, as has been speculated, had briefly grounded while passing over the shoals north of Caribou Island. Canadian lake charts, it turned out, did not accurately indicate the location and extent of these shoals. In any event, the marine technology that the *Fitzgerald* had, and that allowed it to make 748 safe round-trips on the Great Lakes, logging more than a million miles, was not good enough on the night of November 10.³¹⁸

The World War II military emergency devised another system for enhancing navigation of ships that complemented radar. The Long Range Navigation system, nick-named LORAN, was an outgrowth of Royal Air Force and U.S. Navy innovations. LORAN was a timing-based navigation system that

³¹⁸ James Hopp, *Mayday: Tragedy at Sea* (Rogers City, MI: Publisher: James L. Hopp, 2008); William Ratigan, *Great Lakes Shipwrecks & Survivals* (Grand Rapids, MI: Wm. B. Eerdmans Publishing, 1977), 150-61; for more on the *Fitzgerald* see, Frederic Stonehouse, *The Wreck of the Edmund Fitzgerald* (Gwinn, MI: Avery Color Studios, 1998).

worked by measuring the time between when a signal was sent and when it was received. If a ship could receive signals simultaneously from a series of diverse land-based stations, then it could determine its exact position based on its distance from the signal stations. The Navy used it for convoys during the Battle of the Atlantic, where heavy storms often made it difficult for vessels to stay on course. The system was even more important in the Pacific where convoys often had to make rendezvous amid the vast distances of that ocean. Early systems with numerous vacuum tubes and bulky steel housing that made them too heavy for anything but shipboard use. By 1943, however, more compact systems were developed, and LORAN-A units played a major role in guiding B-29 bombers on their long-distance raids on the Japanese home islands. In the 1950s an improved LORAN system was developed with much greater daytime reach. This was LORAN-C which for many years was reserved strictly for military use.

LORAN-C became a widely used aid to civilian navigation in the late 1970s. The new system was highly accurate (to better than 0.25 nautical mile), highly accessible (99.7 percent availability), 24-hour-a-day, and functional in all weather conditions. A chain of LORAN stations along the lakes was operational by 1967. The master station was at Dana, Indiana, and it was served by four secondary stations. Originally, LORAN receivers only provided the navigator with Time Difference (TD) calculations, and it was necessary to consult a chart that was overlain with LORAN so the Time Difference could be converted to Longitude and Latitude. This allowed a vessel's exact position to be plotted. By the late 1980s, however, the best shipboard LORAN receivers were able to actually convert the Time Difference data and plot a vessel's actual location. Advanced systems also allowed the mariner to enter into the system established waypoints such as the vessel's home berth, channel markers, buoys, dangerous shoals, even shipwreck sites. Receivers also were equipped with alarms that sounded when fixed waypoints were approached. The new generation of LORAN-C units could even determine course and average speed of a vessel, all of which automated the task of navigation. Amateur users of LORAN, however, were often unaware of some of the system's limitations, such as the degree to which electrical high-tension wires or steel bridges might throw-off a location reading by several hundred yards. Nonetheless, LORAN-C was a remarkable tool for the sailor. By the 1990s there were an estimated one million LORAN users in the United States, of whom better than 80 percent were maritime related.³¹⁹

The master LORAN station for the Great Lakes region was in Dana, Indiana, a community in the east-central part of the state, 150 miles from the shores of the inland seas. The secondary, or slave station, at Baudette, Minnesota, was more than two-hundred miles from Lake Superior. The secondary station at Seneca, New York, was actually the closest to the Great Lakes being only about fifty miles from Lake Ontario. The remaining two secondary stations at Malone, Florida, and Boise City, Oklahoma, were

³¹⁹ David Wyatt, Mike Tooley, *Aircraft Communications and Navigation Systems: Principles, Operations, and Maintenance* (New York, Routledge, 2013), 175; H. T. Sherman and V. L. Johnson, "The LORAN-C Ground Station," *Navigation: Journal of the Institute of Navigation*, Vol. 23, No.4, (Winter 1976): 349-58.

not even in the region. Each of these stations were manned by Coast Guard crews, although for a time in late 1960s they were assisted by Air Force personnel, while more “Coastie” technicians were being trained to handle the expanding system. They performed a task that was just as vital, if not more so, than the original lighthouse keepers perched in towers above the surf. Originally, LORAN stations had fairly large crews between fifteen and twenty men. In the 1980s automated equipment was installed, and generally a crew of five men or women ensured that the station continued to send its thirty-three-and-one-half pulses per second from the seven-hundred foot skeletal transmission tower. Stations consisted of crew housing, a generator building (which was necessary in case there was a disruption to the electrical grid), the tower, and the transmitter building. Crew members would spend their “watch” monitoring computer screens in windowless rooms surrounded by rows of machines. Boredom was a real problem that was only relieved by coffee while on duty and outdoor recreation when off the job. Like the light keepers of old, they were diligent in their duty. If on rare occasions, the station’s signal went dead, the crew could spring into action and often in less than a minute get it “back on air and in tolerance.” Failure to do so could lead to stiff reprimands. Serious transmission interrupts were rare and usually only occurred when old and outdated equipment was used. While LORAN duty was relatively easy—one old timer advised a trainee, “Your main job will be to keep the beer cold and the firewood dry”—it was not popular with most Coast Guard men who expected duty near blue water. Unfortunately, it was not fully realized until the 1990s that some landlocked “Coasties” had been exposed to dangerous levels of radiation from high-powered vacuum tubes. LORAN crews won no life-saving medals, but their remote service came at the hidden cost of an elevated risk of cancer later in life.³²⁰

As effective as LORAN was, it was no substitute for an experienced captain and attentive deck crews. Apparently neither was present in December 1997 when the \$25 million 634-foot freighter *MV Buffalo* made the turn to leave the Detroit River and enter Lake Erie and promptly plowed head-on into the Detroit River Lighthouse. The light had been guarding the key navigation point since 1885. The *MV Buffalo* had been passing it on a regular basis for better than twenty years. The seas were calm that morning and the weather was clear. The *Buffalo*’s radar and LORAN systems were fully functional. The lighthouse lantern was flashing at its normal six-second intervals, although a build-up of ice may have dimmed the beam. Unfortunately, the *Buffalo*’s bridge crew, which had set their automatic pilot toward the lighthouse, had gone below to collect mail that had just been delivered. One crewman noticed the impending collision but could not alert the wheelhouse in time. The vessel hit the lighthouse to the sickening sound of steel bending and buckling. Amazingly, the well-built spark-plug style lighthouse, that sat atop cement caissons sunk twenty feet into a shoal was, save for

320 Steve McManamen, “Coast Guard on the Wyoming Prairie Near Gillette,” *Gillette News Record*, 4 February 2010, http://rapidcityjournal.com/news/coast-guard-on-the-wyoming-prairie-near-gillette/article_50797d1c-1191-11df-862f-001cc4c002e0.html, accessed August 2015; Pat Glesner, “LORAN For Dummies,” *Coast Guard Stories at Jack’s Joint Front Page*, http://www.jacksjoint.com/loran_for_dummies.htm, accessed, August 2015; “Recreation Gear Sought To Ease Boredom At Coast Guard Station,” *Star Banner* (Ocala, Florida), 13 November 1983; Peggy Revell, “Fort native heading coast guard station,” *Fort Frances* (Ontario) *Times*, 5 August 2005.

a few minor cracks, undamaged while the proud modern vessel limped away with a bow “pushed in like a tin can,” a twenty-foot gash, and \$1.2 million in needed repairs. Past met present that morning and the lighthouse, listed on the National Register of Historic Places, a symbol of another century’s commitment to navigational safety, came away neither bloodied nor bowed. The hapless crew of the *MV Buffalo* was discharged by the chagrined owners of the damaged vessel.³²¹

The reign of LORAN as the most widely used navigational aid on the Great Lakes was brief—over in less than a generation. In 2010 the U.S. Coast Guard ordered the closing of all of its twenty-four signal stations. Crews were reassigned from their landlocked stations and the equipment was sold-off. The sudden demise of this highly successful and widely used navigation tool was caused by the rise of a satellite-based navigation system known as the Global Positioning System or GPS. LORAN had paved the way for GPS since the former was the first radio navigational system that utilized the time difference between when a series of radio signals were received to plot location. GPS employed the same technique, but instead of a chain of land-based transmission stations communication satellites in low earth orbit provided the necessary signals.³²²

Like LORAN before it, GPS was a system developed by the military. Its origins were directly tied to the Cold War. In 1957 the Soviet Union launched the first space satellite, Sputnik. Scientists at Johns Hopkins University’s Applied Physics Laboratory measured the Doppler shift³²³ as Sputnik passed over the United States. This allowed them to both determine the satellite’s orbit, but conversely those same measurements indicated their exact position on earth. The finding immediately opened up the possibility of using satellites as navigational aids. The United States Navy first explored this possibility in the early 1960s with the goal of locating ballistic missile submarines on long-range patrols. There was also the hope that satellite systems might help improve the accuracy of naval and air force weapon systems. A system called Transit was developed that used seven polar orbiting satellites and several land-based stations to send navigational signals. By 1967 Transit was made available to civilian users and enjoyed some popularity with the commercial marine and a few elite pleasure craft operators. Transit satellites had no timing devices aboard, and so land-based receivers had to do the calculations, which could take as long as fifteen minutes. Transit’s significance was that it proved the efficacy of satellite-based navigation. At the same time the United States Air Force and Army were working on satellite-based navigation programs that included the use of atomic clocks. The Department of Defense eventually united the research efforts under an inter-service program, which between 1974 and 1979 tested something they called the NAVSTAR Global Positioning System. The early orientation of the program was toward monitoring atmospheric nuclear tests. Then in 1983 Soviet jet fighters cravenly

321 Larry & Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 98; “Detroit River, MI,” *Lighthouse Friends.com*, <http://www.lighthousefriends.com/light.asp?ID=160>, accessed November 2015.

322 Scott Pace, Gerald P. Frost, Irving Lachow, David R. Frelinger, Donna Fossum, Don Wassem, Monica M. Pinto, *The Global Positioning System Assessing National Policies* (Santa Monica, CA: Rand Corporation, 1995), 37.

323 The Doppler Effect or shift is named after Christian Doppler a Prague based scientist who in 1842 demonstrated that a sound wave (or later a radio wave) will be distorted for an observer relative to its source, such as the change in the sound of a police siren when passing another automobile.



Figure 43. Detroit River Lighthouse that bested the MV-Buffalo in a 1997 incident.

shot down a Korean civilian airplane that had strayed into the USSR's air space. In response, President Ronald Reagan offered the use of GPS to civilian airlines as soon as it was fully operational. Unfortunately, the system's development was hindered by the 1986 explosion of the space shuttle *Challenger*, which was the principal means the United States had to launch new satellites. Nonetheless, by 1994 GPS was operational when the twenty-fourth NAVSTAR satellite was successfully put into orbit. By the beginning of the twenty-first century, seventeen-thousand U.S. military aircraft were outfitted with GPS and sixty-thousand portable military receivers were deployed. In 2000 accurate GPS receivers were for the first time made available to individual consumers for personal use. Within a decade so-called smart phones

equipped with GPS apps provided sophisticated navigational assistance to the ordinary consumer.³²⁴

In 1999 the United States Coast Guard, in cooperation with the Department of Transportation and the U.S. Army Corps of Engineers introduced a modified GPS system to the Great Lakes region, Differential GPS (DGPS). This was an augmented GPS system that corrected the small variation that can occur in signals sent from outer space. It allowed vessels to receive their position to within one to five meters of their actual location. This highly accurate plotting was seen as necessary for ships in confined waters or in approaching harbors. Differential GPS was only for use in U.S. coastal waters and the Great Lakes. To support DGPS, stations were established throughout the United States to correct the signals sent from the orbiting GPS satellites. Eleven of these stations in the United States and two in Canada provide the corrected signals to lake mariners, while eighty-five stations were needed to provide coverage over the entire land mass of the United States and Puerto Rico.³²⁵

³²⁴ Pace, Frost, *et al*, *The Global Positioning System*, 237-48.

186 ³²⁵ United States Coast Guard, *Light List: Great Lakes* (Washington, DC: U.S. Government Printing Office, 2015), xv.

The Unrealized Promise of the St. Lawrence Seaway

The long dreamed of, the often planned, the ever-frustrated St. Lawrence Seaway was finally born on June 26, 1959. President Dwight D. Eisenhower and Queen Elizabeth II presided over the opening, justly proud of the largest such project ever completed through the joint efforts of two countries. The Queen described the new waterway as “one of the outstanding engineering accomplishments of modern times.” Eisenhower recalled the long struggle to build the seaway and celebrated the “culmination of the dreams of thousands of individuals on both sides of our common Canadian-United States border.” The royal yacht *Britannia* passed through six new locks on the St. Lawrence River, being lifted a full sixty-nine meters before cruising across Lake Ontario to the Welland Canal and its eight chambers. Improvements on the Detroit River and Lake St. Clair, as well as the already enlarged Sault Ste. Marie Canal, completed the seaway system.³²⁶

The press celebrated it as “one of the most incredible engineering and construction jobs...ever attempted.” Economists predicted the Midwest would experience “an unprecedented boom of industrial expansion.” One Chicago magazine went so far as to predict 890,000 new industrial jobs for that Lake Michigan city alone. Within a few weeks, as many as thirty ships a day were moving through the new system of locks. By the end of the shipping season it was estimated that six-thousand commercial vessels had made the passage between the Great Lakes and the Atlantic Ocean, as well as an additional six-hundred smaller pleasure craft. The largest vessel to do so was the Norwegian tanker *Solviken* at 610 feet. The long-deferred seaway seemed to be on its way to justifying its optimistic boosters. To international strategists, the seaway represented the triumph of a global strategic and economic vision on the part of the United States and Canada, in which the local concerns were pushed aside in favor a new prosperity based on international trade. Two world wars in the twentieth century had transformed both countries, but especially the United States from isolationism to economic and military activism.³²⁷

Amid the celebrations and anticipations, there were disquieting voices raised. In spite of the tremendous publicity for the seaway, traffic that first year fell five-thousand vessels short of what had been projected. George Horne, transportation reporter for the *New York Times*, predicted trouble ahead when he noted, “Many experts now fear that the Seaway was underbuilt; that new and larger locks will be needed in the future.” This fear was warranted. While the locks of the Panama Canal were 1,000 feet long and 110 feet wide, the seaway chambers were only 766 feet by 80 feet. The seaway project had been badly retarded by its long gestation and botched legislative delivery. “Few projects have been so bitterly opposed,” one political insider recalled, “or inspired so many opinions, arguments, legal battles, treaties and inter-government memoranda.” The navigational advantages of the seaway

326 “Remarks by the Queen and President at the Seaway Dedication,” *New York Times*, 27 June 1959, p.8.

327 Donald F. Wood, *Significance of the Saint Lawrence Seaway to the Great Lakes Commerce and Industry*, (M.A. Thesis, University Wisconsin, Madison, 1957), 1, 26; Claire Parham, “The St. Lawrence Seaway: A Bi-National Political Marathon, A Local and State Initiative,” *New York History*, Vol. 85, No. 4 (Fall 2004): 359-85.



Figure 44. St. Lawrence Seaway.

were less important to many of the project's supporters than the hydro-electric energy and cheap power that would be generated by the dams that needed to be built along the St. Lawrence. Railroad lobbyists as well as Gulf Coast and Atlantic seaboard representatives saw their special interests threatened by the seaway's potential impact on transportation patterns. While they eventually lost the battle to get the seaway built, their continued opposition ensured that the waterway languished. Their political influence diverted federal cargoes that could have been more cheaply shipped via the lakes to rails and East Coast ports. The seaway offered cheaper transportation to heartland manufacturers shipping products abroad. However, it also was a slower route. Even one extra week in transit was regarded as an

unacceptable burden by some businesses that instead used the railroad to get their goods to saltwater ports. The seaway did bring an initial surge in shipping to and from the lakes, but nowhere near the rosy expectations of its boosters. Beginning in the mid-1970s the seaway began to experience a steady decline in ship traffic. In the late 1980s it was hoped that the development of container traffic would revive the flagging seaway. Containers are large steel boxes that are loaded with general cargo and protect it from damage and pilfering. Chicago and other Great Lakes ports invested in new container terminals to capitalize on the trade only to be frustrated by aggressive competition from the railroads and the development of giant container ships that could not fit in the undersized locks of the seaway. Ironically, one of the most important products that came to the lakes via the seaway was foreign-made steel. The mammoth mill complexes along the south shore of the lakes found themselves losing market share to more modern, government-subsidized plants in Asia and South America. In this regard, the seaway hurt rather than helped the regional economy. During the 1980s, in part because of the seaway's shortcomings, what had been America's industrial engine declined and the region

became disparaged as “the rust belt.”³²⁸

Not only did the seaway fail to deliver on its promised boon to Great Lakes shipping, it actually hurt some Great Lakes ports. Since 1826 and the opening of the Erie Canal, Buffalo had been the great transit terminal for the grain trade. But with the improvement of locks along the St. Lawrence River, a large share of the trade began to move north through Canada. Foreign-flagged vessels from Baltic or Black Sea ports picked up grain at Duluth-Superior and took it directly to salt water through the seaway, diverting shipments that in the past went first to Buffalo’s terminals. The seaway also greatly improved Montreal’s position in the trade as the enhanced St. Lawrence waterway was, for some cargoes, a more efficient conduit than Buffalo’s barge or rail connections to New York City. East-bound shipping might make port at Duluth, Chicago, Detroit, or Cleveland, but by-passed Buffalo as vessels passed through the Welland Canal, Lake Ontario, and the seaway to Montreal. Buffalo’s civic leaders anticipated this result, and they had vigorously lobbied against the 1954 legislation that funded seaway construction. When the grain shipments to Buffalo tailed off, the flour mills and breweries, once major employers, declined. Waterfront industries, such as shipbuilding and repair, closed when vessel traffic declined. Buffalo’s population, which had grown in every decade since the opening of the Erie Canal, began a decline that continued in every decade since the opening of the seaway. Once the “Queen City of the Lakes,” Buffalo was dethroned by the seaway. Detroit also received an unwelcome surprise when cargo ships from Germany began to unload Volkswagen Beetles, the “Love Bug” of the 1960s, on to Great Lakes wharves.³²⁹

If the St. Lawrence Seaway failed to deliver the promised economic boost to the Great Lakes economy, it did result in a host of long-term impacts on the ecosystem of the inland seas. The great grain terminals of Duluth-Superior harbor made it one of the busiest Seaway ports. Ships from the Black and Baltic seas regularly sailed there to take-on cargoes of wheat or corn. Before filling their holds, ship captains emptied the ballast water they had taken on in home waters. What they unwittingly dumped into the largest of the Great Lakes were numerous non-native species that quickly spread throughout the basin. It is estimated that 70 percent of the forty-three exotic species that have entered the Great Lakes since the opening of the St. Lawrence Seaway have done so via ballast water transfers. Gallingly, only voluntary ballast guidelines were instituted in 1989, and it was not until 1993 were mandatory rules in place. Those rules were easily and willfully circumvented by foreign-flagged vessels and the problem got worse not better. In the 1980s the zebra mussel, native to the Black Sea, was introduced in this way. This prolific alien produces a million eggs per year, so once it found a home in the lakes it spread rapidly. The finger nail sized mussels latched on to everything in the water. Soon water intake pipes for power plants or water works were clogged with thousands of mussels. Since their introduction, this one species has caused over \$5 billion in damages. That does not count

328 George Horne, “Seaway to Small? An Analysis of its Congestion Problems Indicates Possible Need for Expansion,” *New York Times* 28 June 1959, 60 ; Bob Wiedrich, “Why Does the U.S. Shun Our Port?” *Chicago Tribune*, 7 May 1979; Michael Kuby and Neil Reid, “Technological Change and the Concentration of the U.S. General Cargo Port System: 1970-88,” *Economic Geography*, Vol. 68, No. 3 (July 1992): 272-89.

329 Mark Goldman, *High Hopes: The Rise and Decline of Buffalo*, New York (Albany: State University of New York Press, 1983), 268-73.

the mischief caused by its close cousin, the quagga mussel, or the way it combines with other invaders such as the Round goby to cause avian botulism. As the ecological costs continue to escalate, the St. Lawrence Seaway's negative impacts may soon outweigh any of its realized economic advantages. Of course, the St. Lawrence Seaway was not the sole source of invasive species. The Welland Canal, which was deepened in the 1930s, gave the lakes the sea lamprey and the alewife, which first devastated lake trout populations in the 1940s and then fouled Great Lakes beaches in the 1960s.³³⁰

The Changing Environment of Great Lakes Navigation

The 1970s and 1980s were hard times on the Great Lakes, and across the region thousands of people still shiver in the cold shadow of those years. Instead of a panacea, the seaway was more of a harbinger of a new era of global competition and environmental problems that would reshape navigation on the inland seas. Industrial plants, particularly steel and automobile, built early in the twentieth-century and which operated at such a high level during World War II were outdated and inefficient by the 1970s. Labor contracts and work rules that made sense during boom years became a burden in the face of foreign competition and corporate leader's failure to invest in modernization. Heavy industry did not die in Chicago, Detroit, Buffalo, Toledo, Erie, or Cleveland, but those cities did lose market share and shed workers like an autumn oak. Since the beginning of the nineteenth-century, the region had dramatically grown in population, production, and wealth. It now had to adjust to an era of circumscribed growth, altered expectations, and limited natural resources.

Great Lakes shipping of iron and coal had made the region the great "arsenal of Democracy." Yet in the 1970s both of these backbones of the lake marine underwent profound shifts. Coal was the fuel that powered industrial production and generated urban electrical grids. The transport of coal had traditionally been a commodity transfer from east to west. Railroads brought coal from the Appalachian mines to Lake Erie ports such as Ashtabula, Erie, or Toledo where it was loaded on vessels bound for Upper lake cities and production centers. Yet new efficiencies by railroads made it increasingly more economical to move coal west by rail. Unit trains assembled near the mines and composed completely of coal cars destined for terminals at Midwest power plants began to take a large share of the trade. In this way, the Lake Erie ports were completely by-passed. At the same time that the east-to-west coal trade declined, new environmental regulations made Western low-sulphur coal preferable to the output from some West Virginia mines. Coal began to move from west-to-east as great open pit mines in Wyoming sent their product by train to Duluth-Superior from whence it was taken by lakers to Lake Michigan or Huron ports. Changes to the federal Clean Air Act in the 1970s, therefore, helped to alter one of the major commodity trades on the lakes.³³¹

330 David B. Fischer, "A Tale of Two Environmental Stressors on the Great Lakes," *Natural Resources & Environment*, Vol. 18, No. 2 (Fall 2003): 51-55; Kristen T. Holleck, Edward L. Mills, Hugh J. MacIsaac, Margaret R. Dochoda, Robert I. Colautti, and Anthony Riccardi, "Bridging Troubled Waters: Biological Invasions, Transoceanic Shipping, and the Laurentian Great Lakes," *BioScience*, Vol. 54, No. 10 (October 2004): 919-29; E.L. Mills, J.H. Leach, J.T. Carlton, C.L. Secor, 1993. "Exotic species in the Great Lakes: A History of Biotic Crises and Anthropogenic Introductions," *Journal of Great Lakes Research*, Vol. 19 (1993): 1-54.

331 Larson, *History of Great Lakes Navigation*, 79-80; John Thomasian, *The Clean Air Act, the Electric Utilities, and the Coal Market*, (Washington, DC: Congressional Budget Office, U.S. Government Printing Office, 1982), 46. Environmental regulations alone were not responsible for the growing use

The transport of iron ore for steel production also experienced a profound shift in the 1970s. For nearly one-hundred years the iron ranges of the Lake Superior region had provided high quality ore for the forges of ever-expanding American economy. By the 1950s, however, high-grade ore deposits neared exhaustion and mining companies began to turn their attention to processing formations that previously had been regarded as dross. Their attention focused on taconite, a sedimentary rock in which iron ore was intermixed with quartz, chert, or dolomite. Unlike high-grade ore, which was as much as 90 percent pure iron, taconite was imbedded in rock and was composed of as much as 70 percent impurities. Early in the twentieth century mining companies had experimented with trying to process taconite, which was much more abundant than high-grade ore. The cost of doing so, however, could not be justified while the Mesabi Range was still producing an abundance of its quality ore. After the intensive production of the World War II years, the situation was vastly different, and it was clear that the future of Lake Superior mining depended upon making taconite processing pay. The key breakthrough was made by E.W. Davis, a University of Minnesota scientist who found a way to pulverize the taconite, separate the ore, and roll it into small high-grade pellets. While this procedure was more costly than using naturally high-grade ore, once the taconite was in pellet form, it could be more economically employed in steel making. The creation of taconite pellets also greatly affected the transportation of iron ore on the lakes.³³²

Two new ports were created on Lake Superior to produce and transport taconite. Both Silver Bay, fifty miles northeast of Duluth, and Taconite Harbor further up the coast were company towns and privately built ports. Silver Bay was constructed by the Reserve Mining Company with a capacity to service four to five iron boats a day. Lake Superior provided the large amount of water needed to roll taconite ore into the small round pellets, and it proved a convenient and unfortunate dumping ground for the large amount of tailings leftover from pellet production. For twenty-five years, the Reserve Mining Company dumped tailings into the lake contaminating its pure waters with cancer causing asbestos particles. The dumping was not stopped until 1980 amid great controversy and numerous law suits. Taconite Harbor did not dump tailings into Lake Superior as its pellets were processed inland. Taconite pellets also helped to lead to a new generation of Great Lakes freighters. Taconite pellets can be more easily loaded or discharged than the red hematite ore that once was the mainstay of the Mesabi Range. The uniform, small, round pellets are moved easily from hopper cars to vessel holds and discharged via conveyor belts. Because taconite is a refined and concentrated iron product, it has much greater density, and, therefore, can constitute a heavier burden than traditional cargoes like hematite or coal. In this way, the specific properties of taconite and a renewed emphasis on efficiency helped to give birth in the 1970s to a new generation of super freighters many one-thousand feet in length and specializing solely in taconite transport.

of western coal in the Midwest during the 1970s and 1980s. Mining practice the west was more cost effective which made their low sulphur coal very competitive with low sulphur coal from Appalachia.

332 The best sources for the rise of taconite is the memoir of E.W. Davis, *Pioneering With Taconite* (St. Paul: Minnesota Historical Society Press, 1964) and Jeffrey T. Manuel, *Taconite Dreams: The Struggle to Sustain Mining on Minnesota's Iron Range, 1915-2000*, (Minneapolis: University of Minnesota Press, 2015).



Figure 45. Silver Bay-Reserve Taconite Mining, Magnetic Concentration Plant, Babbitt, St. Louis County, Minn.

In 1969 the United States Army Corps of Engineers opened a new twelve-hundred foot-long lock at Sault Ste. Marie. In anticipation of this, the Bethlehem Steel Company announced it would build a one-thousand foot freighter to supply taconite to its new steel plant at Burns Harbor, Indiana. The *Stewart J. Cort* was the first of a new class of giant lake vessels. The bow and stern sections were built on the Mississippi Gulf Coast, brought under their own power along the Atlantic Coast and up the St. Lawrence Seaway to Erie, Pennsylvania, where the huge midship cargo hold was attached. The construction process took nearly three years, but when it was done, the steel company had a ship that could carry 58,000 tons of taconite, two and a half times more cargo than the 700 foot vessels the *Stewart J. Cort* replaced. As big as she was, the *Cort* was fairly nimble thanks to its twin screws, twin rudders, and bow and stern thrusters that allowed her to move in and out of port unassisted. Unlike previous bulk carriers, such as the famed *Edmund Fitzgerald*, the *Cort* traveled “light” with its hold empty from Indiana to Lake Superior. This was in part because of the decline in the movement of Appalachian coal from east to west, but also because the *Cort* was tailor made for taconite. Between 1972 and 1981 a dozen more one-thousand footers were put into service on the American side of the lake. Their size prevented them from transiting the Welland Canal or the St. Lawrence, which in part explained why Canadian shipping companies did not embrace the design. The super freighters

rendered a large number of older, smaller vessels obsolete. Between 1966 and 2006, the number of U.S.-flagged vessels engaged in bulk transportation on the lakes declined from 154 to a mere fifty-one. The reason for the decline was a mixture of factors from the efficiency of the new one-thousand footers, to the consolidation of the United States steel industry, to the extension of the Great Lakes navigation season into the winter months.³³³

The move from hematite to taconite also impacted the length of the navigation season on the Great Lakes. Natural ore contained moisture, and in cold weather it would freeze in ore cars when being transported to the loading docks, and could not be dumped into the holds of ships. Low winter temperatures could also freeze ore in the hold of a vessel making it impossible to unload until warm weather. Taconite pellets are dry and could be transported in any weather. This created a demand for extending the navigation season on the lakes into the winter months. This had been attempted with very mixed results during World War II. At the end of 1944, the government deployed to the lakes a new Coast Guard cutter, the *Mackinaw*, reputed to be the “most powerful icebreaker in the world.” Yet the *Mackinaw*’s duties were largely restricted to clearing late spring ice from harbor approaches or Lake Superior in the wake of a severe winter. The new super freighters that came into use in the 1970s were all equipped with reinforced bows for ice-breaking. Between 1971 and 1979 the Corps of Engineers and the Coast Guard cooperated in a congressionally authorized experiment of keeping the lakes open for navigation into February. During the mild 1974-76 winters, Great Lakes shipping operated continuously. However, a serious recession in 1980 brought an end to the program as demand for iron and coal declined. Environmentalists expressed reservations regarding winter navigation’s impact on shoreline erosion and the increased chance of accident and oil spills, nor was the Lake Carriers’ Association entirely sold on the prospect of year-round operation. The winter months were an important time to lay vessels up for maintenance and upgrades. Yet when the economy rebounded, the Coast Guard was charged with several regular programs of winter ice breaking. Operation Taconite was the program to keep Lake Superior and the St. Mary’s River open to ore boats shuttling between the mines and mills. A smaller Operation Coal Shovel kept open a navigation channel between Toledo’s coal docks and Detroit power plants, and Operation Oil Can ensured the occasional delivery of oil in the Green Bay and Grand Traverse Bay area. Winter became an especially busy season for the Eighth Coast Guard District. In addition to ice breaking, the service had to retrieve 1,282 buoys and replace about half of those with smaller lighter wintermarks that could withstand ice damage. The government also had to manage ice fenders at locks and bubbler systems at key locations, like the St. Mary’s River. These tubes placed on the lake bottom agitated the water and inhibited ice formation. By the dawn of the twenty-first century, global climate change aided man-made efforts to expand winter navigation.³³⁴

While environmentalists were unable to prevent the expansion of navigation into the winter

³³³ Raymond A. Bawal, *Superships of the Great Lakes: Thousand-foot Ships on the Great Lakes* (Clinton Township, MI: Inland Expressions, 2011), 7-15; Larson, *History of Great Lakes Navigation*, 78.

³³⁴ Thompson, *Steamboats and Sailors on the Great Lakes*, 186-87; O’Brien, *Guardians of the Eight Sea*, 86-89 ; James L .Wuebben, ed., *Winter Navigation on the Great Lakes: A Review of Environmental Studies* (Detroit: U.S. Army Corps of Engineers, 1995), 1-3.

months from the 1970s onward, concern over the broader ecological impact of lake shipping became an increasingly important factor in the Great Lakes Region. The Environmental Protection Agency was the lead department assessing the environmental and social impact of winter navigation. That agency, created by President Richard Nixon in 1970, also came to play a major role in the planning of harbor and channel improvements. Since the beginning of heavy industry along the Great Lakes, the waterways had been used as a dump site for unwanted by-products and waste water. As a result, the bottoms of harbors and rivers became coated with toxic sediment. The deepening of heavily used water courses, therefore, was more than a navigational issue but one fraught with public health implications. The bottom of the Detroit River, one of the most heavily trafficked stretches of the Great Lakes system, was polluted with the waste from the heavily industrialized Rouge River. The Calumet and the Cuyahoga rivers similarly were beset by PCBs and other heavy metals from generations of coke and steel production. Dredging such waterways created two major environmental problems. Where would the toxic sediment be deposited, and what would be the impact of dredging on downstream waters? As much as environmentalists would have loved to see a river bed or harbor cleaned of dangerous deposits, the process of doing so inevitably stirred up sediments that could be carried to new less polluted areas and into drinking water. These were issues that came up every time it was necessary to undertake dredging to maintain the twenty-seven-foot channel required by current lake vessels. Millions of dollars of new costs became necessary to safely landfill toxic sediment. One impact of these new environmental protection realities was to make prohibitive the deepening of lake channels to a thirty or thirty-five-foot depth necessary for a projected new generation of even bigger super freighters. In many ways winter navigation was a preferable way to increase the volume of shipping without having to reengineer the channels.³³⁵

The growing complexity of something like harbor dredging, which has been going on regularly since the 1830s, illustrates the way navigation issues on the Great Lakes no longer took precedence. In the 1960s and 1970s commercial use of the lakes increasingly took a secondary or tertiary position to issues of drinking water, recreation, and ecosystem health. A turning point moment came in the fight over the Indiana Dunes on Lake Michigan. Since the 1920s environmentalists had advocated the creation of a national park to protect thirty-five miles of shoreline dunes and bogs. In the 1950s Bethlehem Steel Corporation and the Indiana General Assembly selected the area as the site of a major new industrial harbor and state-of-the-art steel processing plant. In the end, a compromise was reached and a national park unit was created in 1966, but right in the middle of it was Burns Harbor (aka Port of Indiana) with its huge steel plant and mountains of coal. Economics won out over environmental amenities at Indiana Dunes, but the fight played a major role in activating public concern for the latter. The public “woke-up” to the fact that 86 percent of Lake Michigan’s shore and 70 percent of Lake Erie’s was covered by housing or industry. In the wake of the fight, large sections

³³⁵ William Ashworth, *The Late, Great Lakes: An Environmental History* (Detroit: Wayne State University Press, 1987), 205-8; Larson, *History of Great Lakes Navigation*, 85.

of the Great Lakes were set aside as national lakeshores and state parks. These included Sleeping Bear Dunes on Lake Michigan and Apostle Islands and Pictured Rocks on Lake Superior as well as scores of smaller state parks. Lake Michigan alone was graced with Illinois Beach State Park as well as Michigan's string of twenty and Wisconsin's eleven lakeshore state parks. The growing use of the lakes as a source of recreation would eventually play an important role in the perception and preservation of lighthouses along the inland sea shore.³³⁶

Redundant Sentinels: Lighthouse Automation and Decommissioning

With radar providing mariners an electronic picture of what was in front and around vessels and LORAN and later DGPS providing pin-point plotting of their exact position, the beacon of a lighthouse was regarded by some as a redundant aid to navigation. Yet the lighthouse towers and paper charts that for centuries had been used by mariners to locate their position and steer clear of hazards still had a role to play. Not every sport fisherman, who put a small boat onto the lakes, was willing or able to invest in the latest technology. Storms or accidents could disable electronic systems when they were most needed. Under such circumstances, a lighthouse or pier head beacon remained a saving sight to the beleaguered boater. While some lighthouses still performed a valuable function, by the late 1970s the rationale for staffing them with keepers became tenuous.

The automation of lighthouses, while not common, went back to the period after World War I and the introduction of acetylene lights and automated clock mechanisms that could light or extinguish beacons. These systems were hardly fool proof, and while such stations might not require a twenty-four hour keeper, they did still need some monitoring and occasional cleaning. When the Sand Island Lighthouse on Lake Superior was fitted out with the acetylene system in 1921, the keeper was transferred to the Grand Marais station in Minnesota. Thereafter, the light became the responsibility of the keeper of the Raspberry Island Lighthouse located about seven miles away. In a foreshadowing of what was to become common at the end of the century under the Coast Guard, the Lighthouse Service then leased out the Sand Island keeper's dwelling to a school teacher who used the property as a summer home. The Sand Island Light continued to serve as a vacation residence until 1975 when it was taken over by the National Park Service as part of the Apostle Island National Lakeshore.³³⁷

In the wake of World War II, the Coast Guard began in earnest to automate its light stations. Electrification proceeded faster than actual automation. As late as 1962, 327 lighthouses were still manned in the United States. In 1968 the Coast Guard began the Lighthouse Automation and Modernization Program (LAMP). Over the next twenty years, the process of automating lighthouses increased as over \$26 million was invested in new technology. Solar power was experimented with in the 1980s, and by the end of the decade, the Coast Guard was far advanced in making it standard for

³³⁶ Kay Franklin and Norma Schaeffer, *Duel For the Dunes: Land Use Conflict on the Shores of Lake Michigan* (Urbana: University of Illinois Press, 1983), 124-49; Ashworth, *The Lake, Great Lakes*, 8-9.

³³⁷ "Sand Island, WI," *Lighthouse Friends.Com*, <http://www.lighthousefriends.com/light.asp?ID=689>, accessed, October 2015; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, 396-97.

most of the 16,000 minor lights in American waters as well as many of the Great Lakes lighthouses. One by one lighthouses equipped with electric lights and solar panels were stripped of their crews and automated. The job of lighthouse keeper had gone the way of other once crucial trades such as blacksmith, carriage maker, and typist.

Most lighthouse keepers were reluctant to give up their stations. "I really hated to see it done," complained Fred Dornhecher, the last keeper of the North Manitou Shoal Lighthouse. "It was really kind of a symbol of the area." By 1981 only five Great Lakes lighthouses remained with full crews. At this handful of manned stations the old vigil of watchful waiting continued. One Coast Guard man was on duty at all times to monitor if the beacon was on and if it was sending out the proper flash characteristic—a red or a white flash emitted at a set interval of seconds. The station's radio beacon also had to be monitored so that it also gave out the prearranged transmission on time. Finally, there was the least popular navigational aid with the crew of the light—the fog horn. It was activated whenever visibility dropped to under five miles. Its deep sonorous sound could shake the light tower with its vibrations and render sleep all but impossible. Such audible warnings usually ended when automation took over. The last manned station on the American side of Great Lakes was the Sherwood Point Lighthouse in Wisconsin. It stood guard over the passage from Green Bay to Sturgeon Bay on the Door Peninsula. Finally, at the end of the 1983 season, Sherwood Point was fitted with light sensors and automatic gauges. The tower was locked and the last keeper Mike Ritchie drove away. On the Canadian side of the lakes manned stations endured a bit longer. The last station to be automated was Cove Island in Georgian Bay, which was stripped of its keeper in 1991.³³⁸

Technology made automation possible, but declining federal budgets played a role in the pace of the process. A lighthouse crew of three Coast Guard men required an outlay of \$80,000 annually. Between 1968 and 1983, the penny-wise Department of the Treasury that administered the Coast Guard saved \$18 million dollars by replacing crews with sensors and solar panels. This type of cost savings made the ending of the manned lighthouses a priority for the service. Yet as the automation program went forward, the question of what would become of the housing and outbuildings that made up a lighthouse complex was left unexamined.³³⁹

Privatization of these federally-built structures seemed a logical solution, especially as post-Vietnam War America turned increasingly conservative in its political inclinations and budget cutting became an annual exercise. In the 1980s Congress and the administration of President Ronald Reagan nudged the Coast Guard away from its navigation safety mission and toward illegal drug interdiction. As far back as 1963, the Coast Guard had turned over surplus lighthouses to local interest groups. The Michigan City Lighthouse was an early example on the Great Lakes. Built in 1858, the lighthouse was

³³⁸ Bruce J. Berman, "Just Last Year a Guy Tried to Jump Off the Tower," *Chicago Tribune*, 18 April 1971:40-44 ; Eileen Ogintz, "Last Lighthouse Loses Human Touch," *Chicago Tribune*, 14 December 1980 ; Art Barnum, "Automation Dims Manned-Lighthouse Era," *Chicago Tribune*, 13 February 1984: 8; Wayne Sapulski, "The Imperial Towers of Lake Huron and Georgian Bay," *Lighthouse Digest* (December 1996), <http://www.lighthousedigest.com/digest/StoryPage.cfm?StoryKey=156>, accessed October 2015.

³³⁹ Eileen Ogintz, "Last Lighthouse Loses Human Touch," *Chicago Tribune*, 14 December 1980; Art Barnum, "Automation Dims Manned-Lighthouse Era," *Chicago Tribune*, 13 February 1984:8.

left vacant in 1940 when the station was automated. The station had been done in the “school house style” with the dwelling and a low light tower cupola all in one structure. It had long been superseded by a more prominent pier head light and its beacon tower had been removed. The local community was, however, attached to the 1859 lighthouse, in part, because it was the home of legendary keeper Harriet Colfax for forty-three years. After the pier head light had been automated, the old lighthouse was closed. For nearly twenty-five years it stood vacant, deterioration and vandalism took a toll on the historic structure. Yet, the lighthouse occupied a prominent place in the city adjacent to a popular park. When what had once been a source of pride to Michigan City instead became an eyesore, city officials took action. They contacted the Coast Guard about taking over the building only to be rebuffed. Finally, in 1965 the Coast Guard sold the structure to the city, which in turn granted a two-year lease to the Michigan City Historical Society on the condition that they restore the building and operate it as a museum.³⁴⁰

A long effort to raise the funds for restoration began immediately thereafter. The saga of the Michigan City Lighthouse was a forerunner to the joys and frustrations that many later lighthouse preservationists would encounter. Initially, the historical society hoped to get the \$80,000 that was needed for restoration by selling lighthouse bonds for between \$1 and \$5, but despite strong support from the community, the effort fell well short. In an effort to jump start the restoration, volunteers took up paint brushes, and prisoners at the Indiana State Prison “donated” their time building structural supports. It was not until 1973 that the lighthouse was restored enough to be opened to the public. All furnishings in the keeper’s quarters had been provided by residents. A replica of the original lantern room roof was installed. The work of maintaining the lighthouse since 1973 has been almost as demanding as the initial restoration. In 2014 a new replica lantern room was installed, and in spite of hundreds of hours of volunteer maintenance the exterior of the lighthouse demanded an estimated \$205,000 of additional work. Yet, Michigan City received something important if intangible in return for the capital and sweat the community put into the lighthouse. As one resident said, “Our message is that this is a place to feel a real sense of accomplishment. We have tremendous respect for this building and for what people have contributed over the last 40 years.” Many residents came to regard the lighthouse as a “shrine” and a symbol of their city.³⁴¹

Another early experiment in privatization of automated and unmanned lighthouses took place in Chicago. The Chicago Harbor Lighthouse, which dated from 1917, was a prominent feature of the “Windy City” lakefront. Located a quarter of a mile off Navy Pier, it was automated in 1978, and its crew were reassigned. Unexpectedly, the Coast Guard was immediately contacted by Sterling Bemis, a thirty-seven year old salesman. Bemis was an avid boater, who had fallen in love with the idea of making

340 “Society Accepts Lease to Restore Lighthouse,” *Chicago Tribune*, 14 March 1965: 2.

341 Bernard Judge, “Hope to Raise \$80,000 to Restore Lighthouse,” *Chicago Tribune* 23 October 1966: q4; “Prisoners Assist with Lighthouse in Michigan City,” *Chicago Tribune*, 11 June 1967: 3; Jessica O’Brien, “New Lantern Room Not the End of Upgrades for Old Lighthouse Museum” *Michigan City News-Dispatch* 18 October 2014, http://www.thenewsd Dispatch.com/news/article_00fe9490-5712-11e4-9149-a32fd22efd1f.html, accessed September 2015; Rick Richards, “Dreams Beckon Inspiration at Michigan City Lighthouse,” *Lighthouse Digest*, (July/August, 2011), <http://www.lighthousedigest.com/Digest/StoryPage.cfm?StoryKey=3550>, accessed September 2015.

the abandoned lighthouse his home. This was no small challenge in part because the lighthouse could only be reached by boat, and also because the Coast Guard rejected his offer outright. For months, Bemis lobbied the federal agency, first through an attorney, who gave up after repeatedly being told “No,” and finally by Bemis himself who used his sales experience to eventually receive permission to lease the lighthouse. The new tenant faced major mildew and paint peeling problems in every room of the eighty-five foot tall structure. One room at a time, he set about making a home. Getting groceries and removing garbage were major headaches, but not as bothersome as the 113-decibel fog horn that sent vibrations running through the entire building whenever visibility was reduced. Winter was one obstacle he could not overcome as the uninsulated tower had been unmanned after the close of the navigation season. Bemis spent several years at the lighthouse. He only paid \$1,050 a year rent for the tower, but he made himself useful by taking on the repair of windows damaged by birds or storms. Bemis was eventually able to find a partner to share the beacon with, and his wave-washed bride-to-be and a Cook County marriage court justice braved heavy seas on the day of the wedding to say “I do” at the lighthouse. However, Bemis’s time as a lightkeeper would not last long. In 2004 the City of Chicago named the structure a city landmark and began proceedings to have the Coast Guard transfer ownership to municipal authority. After five years, the transfer finally was made.³⁴²

The reason the Coast Guard eventually yielded to Sterling Bemis’s request for occupancy of the Chicago lighthouse was because in the short time the light had been abandoned, it suffered considerable deterioration due to lack of up keep. Bemis took on the not inconsiderable job of making the basic repairs necessary to keep out the environment. The Coast Guard soon discovered that without such on-going maintenance, lighthouses that were automated and unmanned would quickly deteriorate. Lighthouses survived for decades because an on-site keeper made immediate repairs to the minor wear-and-tear faced by structures. Even back in the pecuniary days of Stephen Pleasonton’s administration of U.S. lighthouses in the first half of the nineteenth-century, half the cost of lighthouses went to annual repairs. Another problem was vandalism. The Coast Guard should have expected that its abandoned light stations would become magnets for break-ins. The St. Helena Island Lighthouse in northern Lake Michigan could have served as a lesson as to the danger posed by vandals. St. Helena was the first Michigan station to be automated when it was fitted with a sun-valve system in 1922. At that point, the keeper was withdrawn and the property became vulnerable to vandals. Over the decades that followed, even though the light was on a remote island, everything of value or that could possibly be taken away was looted, doors, banisters, floor boards, even bricks. Fires were carelessly set and allowed to burn while outbuildings were all but demolished. So bad did the site become that the Coast Guard would have demolished the ruined complex if it had had the funds to do so. Fortunately, in 1986 the Great Lakes Lighthouse Keepers Association, a group dedicated to lighthouse history and preservation took on the salvation of the wrecked St. Helena station, and with the help of the Boy

198 ³⁴² The Chicago Harbor light was built in 1893 but moved to its breakwater location in 1917. Douglas Frantz, “He Makes a Big Move that Will Light Up His Life,” *Chicago Tribune* 18 May 1980: 1.

Scouts of Michigan began a long and on-going restoration project. The Coast Guard learned from this experience, and beginning in 1985, it operated a leasing program for decommissioned lighthouses under a joint agreement between the Department of Transportation, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers.³⁴³

The New Keepers of the Light

The Coast Guard was mandated to cooperate with historic preservation organizations because the growing importance of cultural heritage in late twentieth-century America. Beginning with the passage in 1966 of the National Historic Preservation Act, a system of federal and state, private and public agencies, and organizations had ensured that potential effects upon historic sites were—in the words of the Act—“taken into account” in federal government actions. In 1971 President Richard Nixon deepened the federal government’s commitment to historic preservation when he issued Executive Order 11593, which ordered all agencies of the national government to inventory and administer significant cultural resources under their control in such a way that they be “preserved, restored and maintained.” The Coast Guard then set about assessing which of its 481 light stations nation-wide were historically significant under the terms of the National Historic Preservation Act. Eventually, most lighthouses would qualify for the National Register of Historic Places with more than 450 being listed. This status ensured that most lighthouses would receive careful local and federal attention. By the late twentieth-century, experience had taught the Coast Guard that the preservation of individual lighthouses would be better ensured if they were occupied by tenants charged with the maintenance of the historic property. The agency was encouraged in this direction by a variety of private organizations of lighthouse enthusiasts, who were committed to the preservation of historic navigational aids. The United States Lighthouse Society was formed in 1981 under the leadership of a former Coast Guard officer and headquartered in California. The organization was committed to promoting the history of American lighthouses and lightships. A year later, on the East Coast, the Lighthouse Preservation Society was founded and focused on the preservation of the hundreds of lighthouses that had been vacated by the Coast Guard. In 1994 the American Lighthouse Foundation was founded to take on the actual restoration and educational operation of a variety of lighthouses mostly on the Atlantic Coast, but eventually reaching into the Great Lakes with the Oswego Lighthouse.³⁴⁴

Not to be outdone lighthouse enthusiasts on the United States side of the Great Lakes began to organize in 1982. Under the leadership of Donn and Diane Werling, who were keepers of the decommissioned Grosse Point Lighthouse in Evanston, Illinois, the Great Lakes Lighthouse Keepers Association (GLLKA) was formed as a Michigan not-for-profit. Many of the early members were

³⁴³ Bruce Roberts, Ray Jones, *Western Great Lakes Lighthouses: Michigan and Superior* (Guliford, CT: Globe Pequot Press, 1994), 12; Terry Pepper, “St. Helena Island Lighthouse,” *Seeing the Light*, <http://www.terrypepper.com/lights/michigan/st-helena/st-helena.htm>, accessed September 2015; Sarah Gleason, *Kindly Lights: A History of Lighthouses of Southern New England* (Boston: Beacon Press, 1991), 87; David Reese and Robert Browning, “Lighthouse Management: A Balancing Act By the U.S. Coast Guard,” *CRM-Cultural Resource Management*, Vol. 20, No. 8, (1997): 37-39.

³⁴⁴ Executive Order 11593—Protection and enhancement of the cultural environment, <http://www.archives.gov/federal-register/codification/executive-order/11593.html>, accessed September 2015; “Museum History & Chronology,” National Lighthouse Museum, <http://lighthousemuseum.org/welcome/museum-history/> accessed November 2015 ; William C. Hidlay, “Lighthouse battle is Not a Thing of the Past,” *Chicago Tribune* 10 November 1991: 1E.

former light keepers with a deep personal interest in preserving the stories of the men and women who had lived in the isolated stations and kept the beacons lit and the brass polished. Yet like the Lighthouse Preservation Society, they were also focused on the preservation of troubled lighthouses along the inland seas. Shortly after their formation, GLLKA began the decades-long effort to restore the decrepit St. Helena Island Lighthouse. Over the years, they have been a valuable resource and helped with the preservation of the Round Island Lighthouse (Lake Huron), Beaver Island (Lake Michigan), and the Cheboygan River Front Range Light. Their annual meetings and tours of hard-to-reach lighthouses are a resource for lighthouse historians and enthusiasts from across the region.³⁴⁵

Lighthouse preservationists in all these organizations succeeded in raising awareness of the growing danger of deterioration to the nation's navigational aids. Their efforts led in 2000 to a significant amendment to the National Historic Preservation Act. Titled the National Historic Lighthouse Preservation Act, the new law laid out a procedure by which local groups could preserve light stations critical to community heritage while at the same time relieving the Coast Guard of the burden of maintaining hundreds of obsolete navigational aids. Under the legislation the Coast Guard would work with lighthouse preservationists, the National Park Service, and the General Services Administration to dispose of lighthouses that no longer met the requirements of the Coast Guard. The first step in the procedure was for the Coast Guard to declare the lighthouse "excess" to its mission. At that point, the National Park Service would aid in determining if the lighthouse was eligible for listing on the National Register of Historic Places. If a light was not historically significant, it would be transferred to the General Services Administration and disposed of like any other piece of redundant government property, usually by sale to a private party. A lighthouse determined to be eligible for historic status, as most light stations are, is first made available to not-for-profit groups or local government entities dedicated to history and preservation. Such groups must prepare a plan for the care of the structure and pledge to make it available to the public for education and tourism. This procedure was greatly needed because by the late 1990s, the Coast Guard was rapidly declaring lighthouses to be "excess property." In 1997 forty Great Lakes lighthouse were so declared. Before the National Historic Lighthouse Preservation Act (NHLPA), historical groups, some of which had already donated time and money to the protection of a lighthouse, had limited options available to them. If they partnered with a local government entity willing to apply for the property through the Historic Monuments program, historic groups could then lease the light. Without such government support, disposal of the property simply went to the highest bidder. While the Act moved preservation groups to the head of the line when it came to property disposal, the Act did little to actually help individual groups carry out the work of restoration and public education. In keeping with the spirit of the times, it effectively privatized the continued maintenance for a vast system of historic navigational aids that had once been the pride of the federal government.³⁴⁶

³⁴⁵ "Who Are We," Great Lakes Lighthouse Keepers Association, <http://www.gllka.com/who.html>, accessed September 2015.

200 ³⁴⁶ National Historic Lighthouse Preservation Act of 2000, *Senate Report 106-380*, 106th Congress, 2nd Session, 16 July 2000. The state of Michigan,

On the Canadian side of the Great Lakes a similar process was taking place. As automation and satellite navigation systems advanced, the Canadian Coast Guard was anxious to be relieved of the burden of maintaining light stations. Citizens interested in the preservation of these structures were frustrated because under Canadian law, federal structures cannot be afforded protected landmark status under either local or national historic preservation statutes. There was a Federal Heritage Building Review Office that could protect lighthouses from demolition, but it had directed little



U.S. Coast Guard

Figure 46. St. Helena Island Lighthouse saved and restored through the work of the Great Lakes Lighthouse Keepers Association and the Boy Scouts.

attention toward navigational aids. In 2008 public pressure from communities interested in protecting lighthouses important to local identity and tourism finally pressured Parliament to address the issue. The Heritage Lighthouse Protection Act set up a process by which a select group of light stations could be afforded protected status. Initially, fourteen Great Lakes lighthouses were designated under this legislation. The Act allocated no new funds for preservation of lighthouses. Unfortunately, in 2010 the Canadian Coast Guard declared the majority of the remaining lighthouses surplus and a rapid privatization process was set in motion.³⁴⁷

In peril on both sides of the border, the lighthouses of the inland seas were not without friends. Across the region scores of grassroots organizations sprang into being committed to preserving a lighthouse in their area. By 2015 twenty-five of the approximately 124 lighthouses in the State of Michigan alone had been transferred from federal control, while across the country many more lighthouses had been either donated or sold. One group that received a donated lighthouse was the Friends of Point Betsie Lighthouse which was formed when the Coast Guard transferred the site to Benzie County, Michigan, in 2004. The light had been among the last manned stations on Lake Michigan and was not automated until 1983. The light tower and out buildings soon began to suffer from neglect, and when the transfer took place, extensive work was needed for all structures. Yet

recognizing this gap, subsequently approved funds raised through the sale of special license plates to support lighthouse preservation, in their Michigan Lighthouse Assistance Program. See <http://www.michigan.gov/mshda/>.

347 The Heritage Lighthouse Protection Act, Parks Canada, <http://www.pc.gc.ca/progs/lhn-nhs/pp-hl/index.aspx>, accessed, October 2015 ; Michael MacDonald, "Canada deciding on heritage status for surplus lighthouses," *Toronto Star*, 28 May 2015, <http://www.thestar.com/news/canada/2015/05/28/feds-deciding-on-heritage-status-for-surplus-lighthouses.html>, accessed October 2015.

within a decade, an aggressive capital campaign in the region and timely state and federal grants allowed the “friends” to completely restore the complex, install interpretative exhibits, a gift shop, and develop a two-bedroom vacation apartment in the Assistant Keeper’s quarters to help sustain the operation of the historic site. The fact that Benzie County is a popular summer tourist destination was a significant aid to the Friends of Point Betsie Lighthouse efforts. Visitation helped to generate income, community interest, and spur donations.

The restoration of the Mendota Lighthouse on Lake Superior was more of a solitary effort. Gary Kohls, a downstate Michigan businessman spotted the structure in September 1997 while on a motorcycle trip. The station was in poor condition after having been decommissioned as a light and abandoned in 1952. Kohls acquired the property in 1998 and set about an extensive restoration of building and grounds. He was even able to locate the original fourth-order Fresnel lens, which he had reinstalled and relit. In 2015 the station was once more a functioning private navigational aid.

A more difficult preservation challenge has been the Port Austin Reef Light which is located a mile and a half off shore in Lake Huron. The station was automated in 1953 and suffered the inevitable deterioration over the next three decades until it found a savior in the person of Lou Schillinger, a resident of Port Austin. Schillinger negotiated a five-year lease from the Coast Guard with the promise he would do his best to stabilize the structure. His efforts and those of his family and friends led in 1988 to the formation of the Port Austin Reef Light Association, Inc. For several decades they acted as caretakers for the lighthouse. In the face of repeated vandalism, they invested thousands of dollars in repairs and rehabilitation. Finally, in 2011 the station was listed on the National Register of Historic Places, which according to the National Historic Lighthouse Preservation Act (NHLPA), empowered federal authorities to turn over ownership of the structure to the association. Yet access to the off shore light is problematic and public interpretation largely takes place at Port Austin History Center on the mainland.³⁴⁸

These stories are a mere sample of scores of similar scenarios that have been enacted across the Great Lakes region. Several lighthouses that failed to find a not-for-profit preservation group have found new owners, who have transformed the sites into for-profit bed and breakfast inns. The Sand Hills Lighthouse on the Keweenaw Peninsula was one of the pioneers of this mode of preservation when it was bought by Mary Mathews and William Frabotta in 1961. The Big Bay Lighthouse, also on Lake Superior, has been serving guests since 1986 after its two-story brick dwelling and adjacent tower underwent a sometimes painful transformation. Originally, the station was sold via sealed bid to a Chicago surgeon, who spent several years altering the physical integrity of the property in an attempt to make it a summer home. What had originally been a duplex designed to house two keepers and their families, was modified into a single dwelling. The property was further modified in 1979

³⁴⁸ “Stewards Needed for Four Historic Great Lakes Lighthouses,” News Release, General Services Administration, 21 May 2015; Friends of Point Betsie Lighthouse, “Our Restoration Story,” <http://www.pointbetsie.org/restoration.html>, accessed September 2015; Port Austin Reef Light Association, “History,” http://www.portaustinreeflight.org/?page_id=12, accessed September 2015.

when a subsequent owner struggled to convert the dwelling into an inn. Eventually, a new group of owners arrived to make that dream a reality. With the help of spectacular views of Lake Superior, a close connection to a murder that was turned into the hit motion picture *Anatomy of a Murder*, and the rumored ghost of a former keeper who met a tragic end, the inn has thrived. Michigan alone has five other lighthouse inns. Besides those mentioned, they include, Jacobsville Lighthouse, Middle Island Lighthouse, Charity Island Lighthouse & Bed & Breakfast, Pipe Island Lighthouse, as well as two former Coast Guard stations that have been so adapted. Nine restored lighthouses in the state also offer a guest keeper program where, for a fee, individuals can serve for several days or weeks as resident keepers. Lake Ontario has several lighthouses that accept overnight guests, including the Braddock Point Lighthouse Bed and Breakfast, which was saved from Coast Guard neglect by ten years of restoration by the property's first private owners. That site illustrates the many challenges faced by this type of adaptive reuse. The original light tower at Braddock Point was a 110-foot brick structure. The Coast Guard tore down two-thirds of it in the 1950s due to deterioration. What remained was nick-named "the stump." At considerable cost, private owners tried a cosmetic fix in 1995 when they reconstructed the tower to a height of sixty-five feet, an improvement but hardly a restoration. High-water levels also forced them to add a 175-foot breakwater wall to prevent flooding and erosion. Both changes while helpful to the site's continued existence compromised its historical integrity.³⁴⁹

Privatization has spawned a new generation of highly dedicated light keepers. Yet sloughing off the costs of the preservation of these structures to citizens and local governments does mark a sad retreat from the time when lighthouses were proud symbols of a strong government committed to the common good. The restoration of these historic structures is a major challenge because of their exposed and often isolated locations. The challenge is compounded because there are often serious hazardous materials issues at lighthouses. During the Coast Guard era, the interior of lighthouses were routinely covered in leaded paint. That paint is now a chipped and peeling hazard to visitors, especially young children prone to touching everything around them. Even more of a problem is the potential for lead accumulation in the soil near structures that for years were painted and repainted with lead paint, which may have been spilled or scraped onto the ground. Mercury poisoning is another threat that has to be addressed by lighthouse preservationists. In the 1890s when rotating lights were needed to give each lighthouse a distinctive flash signature, the lighthouse authorities in both the United States and Canada mounted lenses on bearings encased in about two-hundred pounds of mercury. At the time, little thought was given to the vapors released by the mercury, a highly poisonous substance. Today only one United States lighthouse still has its mercury bearing case, the Split Rock Lighthouse on Lake Superior. After a special health study was done in 2009, protocols were put in place there to ensure the lighthouse's staff and the 100,000 annual visitors were not endangered. Nonetheless, mercury remains a potential threat at many lighthouses since there may have been spills either in the station or on the

349 Terry Pepper, "Big Bay Point Lighthouse," *Seeing the Light*, <http://www.terrypepper.com/Lights/superior/bigbay/bigbay.htm>, accessed September 2016; Larry and Patricia Wright, *Great Lakes Lighthouses Encyclopedia*, 20.

grounds during normal maintenance procedures or when the mercury bearing cases were removed by the Coast Guard. Many lighthouses that no longer have mercury on site may still have traces of long-forgotten mercury spills. Lighthouse keepers periodically opened the mercury bearing cases to clean them and inevitably mercury spilled. When the Coast Guard removed the bearing cases from most lighthouses in the 1960s and 1970s, concern about the toxicity of mercury was much less than it is today, and the safety of future visitors was not a concern. When the Baker's Island Lighthouse in Maine was automated in 1972, the Coast Guardsmen removing the bearing case were overcome by fumes and required emergency evacuation. There is a danger that past mercury spills at lighthouse sites were not reported or recorded, and it is a poison that remains dangerous for decades. It is worth noting the Coast Guard has undertaken soil remediation at some (but not necessarily all) lighthouses, before the lights have been transferred out of federal ownership.³⁵⁰

Great Lakes lighthouses are popular tourist attractions and touchstones of local identity. The private and governmental institutions that have rushed into the maintenance void created by Coast Guard decommissioning have done a considerable public service by their restoration activities. Unfortunately, lighthouse restoration never terminates, the job is never done. Every storm, every winter, every malicious vandal demands renewed attention and dollars. If the light towers on the inland seas are going to continue to endure, they will require long-term care decade after decade. These lights were born out of a national commitment to a public good. In the nineteenth and twentieth centuries, that commitment was to safe navigation and commerce. In the twenty-first century, that public good is a common heritage that can help bind together the peoples of the Great Lakes region and enable them to be better stewards of more than 20 percent of the world's most precious resource—fresh water. Local governments, private citizens and non-profits are the new keepers of the lights. Their long-term success requires both love and money. The threat to lighthouses remains and in many ways grows graver each year. The new private keepers of the lights mean well, but the most poorly funded cultural institutions in the United States are local historical museums, and these are the very institutions—along with local governments—that the National Lighthouse Preservation Act entrusted to rescue the Coast Guard from the heavy burden of long-term maintenance. If that vision has any hope for enduring success, then a federal annual fund or endowment is required to help the new light keepers sustain these tangible reminders of our maritime heritage.³⁵¹

350 Carl Herbrandson, *Health Consultation, Mercury at a Lighthouse, Split Rock Lighthouse, Two Harbors, Lake County, Minnesota* (St. Paul: Minnesota Department of Health Environmental Health Division, 2009), 8,15-17; Edward Rowe Snow, Jeremy D'Entremont, *The Lighthouses of New England* (Carlisle, Mass: Commonwealth Editions, 2003), 157.

351 John Dichtl, "Historical Organizations: Ubiquitous but Under-resourced," American Academy of the Arts & Sciences, Academy Data Forum, 25 September 2015, <https://www.amacad.org/content/research/dataForumEssay.aspx?i=21941>, accessed November 2015.

CHAPTER 8

National Landmark Status and Great Lakes Aids to Navigation

Introduction

This chapter of the report consists of two related sections: 1) A rationale is proposed for considering nationally significant Great Lakes aids to navigation for inclusion in the National Historic Landmarks system; 2) Specific recommendations will also be made for six maritime cultural landscapes that incorporate historic navigational aids with other significant elements of their maritime landscape.

Qualifications for Great Lakes Aids to Navigation NHL Status

The determination of a rationale for the national significance of Great Lakes aids to navigation is based on seven elements: The National Landmark criteria established in the Code of Federal Regulations, Title 36, Part 65.4 [a and b]; the National Park Service's historical Thematic Framework as revised in 1994; the 2002 "Light Stations in the United States" Multiple Property Documentation Form; the associated "Summary Context Statement for NHL Lighthouse Nominations (no data, ca. 1998);" the 2013 "U.S. Government Lifesaving Stations, Houses of Refuge, and pre-1950 U.S. Coast Guard Lifeboat Stations" Multiple Property Documentation form; the rationale for five existing Great Lake National Historic Landmark aids to navigation; and the themes and chronology presented in the earlier chapters of this report: "Great Lakes Navigation and Navigational Aids Context Study."

National Landmark Criteria

National Historic Landmarks are exceptional sites, districts, structures, or objects illustrating or interpreting the heritage of the United States in history, architecture, archeology, engineering, and culture and that possess a high degree of physical integrity. There are six criteria for consideration.

1. That are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history and from which an understanding and appreciation of those patterns may be gained.
2. That are associated importantly with the lives of persons nationally significant in the history of the United States.
3. That represent some great idea or ideal of the American people.
4. That embody the distinguishing characteristics of an architectural type specimen exceptionally valuable for a study of a period, style or method of construction, or that represent a significant,

distinctive and exceptional entity whose components may lack individual distinction.

5. That are composed of integral parts of the environment not sufficiently significant by reason of historical association or artistic merit to warrant individual recognition but collectively compose an entity of exceptional historical or artistic significance, or outstandingly commemorate or illustrate a way of life or culture.
6. That have yielded or may be likely to yield information of major scientific importance by revealing new cultures, or by shedding light upon periods of occupation over large areas of the United States. Such sites are those which have yielded, or which may reasonably be expected to yield, data affecting theories, concepts and ideas to a major degree.

National Park Service's Historic Thematic Framework

In 1994 the National Park Service revised its thematic framework for evaluating and interpreting historic sites under its jurisdiction. The framework is basically a conceptual tool that outlines the major themes that make-up American history. It is used to help identify cultural resources that embody America's past and to describe and analyze the multiple layers of history encapsulated within each resource. It is composed of eight broad topical areas.

1. Peopling Places.
2. Creating Social Institutions and Movements.
3. Expressing Cultural Values.
4. Shaping the Political Landscape.
5. Developing the American Economy.
6. Expanding Science and Technology.
7. Transforming the Environment.
8. Changing Role of the United States in the World Community.

"Light Stations in the United States" Multiple Property Documentation Form

A multiple property documentation form is used as a basis for evaluating the eligibility of thematically-related historic properties. It contains historic contexts and defines the property types that represent those contexts. The form establishes the requirements by which thematically-associated properties can be simultaneously nominated to the National Register or by which individual properties may be nominated in the future. In 1997 the United States Coast Guard contracted with the National Park Service National Maritime Initiative to prepare this document in order to complete an evaluation of National Register eligibility for all lighthouses under its jurisdiction. This followed a 1994 comprehensive survey of lighthouses across the United States. The context was derived from two draft studies, one completed in 1993 by lighthouse historian Ross Holland, which focused on the administrative history of the lighthouse service. Ralph Eshelman prepared a typology of lighthouse construction types in 1997. Candace Clifford with the National Park Service's National Maritime Initiative edited the final document.

Great Lakes Navigation and Navigational Aids Context Study

Between October 2015 and February 2017, the National Park Service contracted for a historical context study to be completed focused on Great Lakes navigation and navigational aids. That product narrated the evolution of Great Lakes maritime history and placed those developments in the context of the broad patterns of American history. Based on that study, I have identified four chronological periods between 1789 and 2000 (with some overlap) that reflect the changing role of Great Lakes navigation and navigational aids in regional and national history. These chronological periods are:

- 1) The role of navigation aids in spreading a national communication and market revolution to the Great Lakes region in the period, 1789-1837.
- 2) The role of Great Lakes navigation aids in the national conflict over internal improvements and sectional economic development, 1838-1866.
- 3) The role of navigational aids in the industrialization of the Great Lakes region, 1866-1945.
- 4) The role of the Great Lakes in the development of electronic and automated systems of navigation and navigational aids, 1920-2000.

This history indicates that while to some extent Great Lakes maritime history relates to all of the National Park Service's Themes, there are four themes that are intimately tied to navigation history. These themes are the role of lighthouses in "Peopling Places," "Transforming the Environment," "Developing the American Economy," and "Expanding Science and Technology."

Current Great Lakes Navigational Aid National Historic Landmarks

There are five current National Historic Landmarks (NHL) that represent the history of navigational aid changes of the Great Lakes. These five sites are the Grosse Point Light Station in Illinois, the Split Rock Light Station in Minnesota, the Lightship *Huron* (LV-103) currently positioned in Michigan, the North Manitou Island Life Saving Station in Michigan, and the St. Mary's Falls Canal/Soo Locks in Michigan. The rationale for each of these NHL properties is useful in constructing requirements for future navigational aid NHLs.

Grosse Point Light Station was listed as a National Landmark in January 1999, eligible under Criteria 1 and 4. Its period of significance is 1873 to 1941, spanning the years between construction and decommission. The significance statement stressed the importance of the 1873 lighthouse in the maritime history of Lake Michigan, the critical port of Chicago, and how these related to the national economy. The nomination also stressed the design of army engineer Orlando Poe and his important role in Great Lakes navigational aids. Finally, the nomination made clear Grosse Point's high degree of integrity possessing its keeper's quarters, fog signal structures, and alone among remaining Great Lakes lights its second-order Fresnel Lens.

Split Rock Light Station was constructed between 1909 and 1910 and was designated a National Historic Landmark in June of 2011. It is eligible under Criteria 1 and 4, and its period of significance is

1909 to 1961, the years between construction and decommission. The significance statement stressed the property was:

... nationally significant for its association with the development of American commerce and transportation on the Great Lakes. It served as a vital aid to navigation for commercial freighters traveling the shipping lanes that served the bustling ports of Two Harbors and Duluth-Superior, Minnesota. These harbors were located closest to the Minnesota Iron Range, which contained the nation's largest and richest iron ore deposits – the primary ingredient for making steel.

The property is also nationally significant as a highly-intact and stylistically cohesive twentieth-century light station. It has a very high degree of integrity with intact outbuildings, three keeper's quarters, and important mechanical features such as pump houses, tramway, and an engine house.³⁵²

Huron (LV-103) was listed as a National Historic Landmark in December 1989. It is eligible under Criteria 1 and 4. Launched in 1920 and commissioned in 1921, the *Huron* spent the bulk of her career guiding vessels through the critical navigational choke point where Lake Huron narrows and flows into Lake St. Clair. For a generation between 1940 and 1970, the *Huron* was the only lightship on the Great Lakes. Specifically designed for Great Lakes service, the lightship derived its national significance from the facts that it was the only surviving representative of 96-foot class of lightships built between 1918 and 1920 and the only surviving lightship to serve on the Great Lakes. The *Huron* has two distinct periods of significance. The years 1920 to 1970 are associated with the themes of government policy and humanitarian service. The period of significance of 1920 to 1948 reflects the vessel's innovative design, before it was modified.

North Manitou Island Life Saving Station was designated a National Historic Landmark in August 1998. Of the nearly 200 lifesaving stations established across the nation, this property is the only remaining station that encompasses the entire lifesaving service history, from the volunteer era through the Coast Guard era. The station was declared obsolete by the Coast Guard in 1933. It was designated under Criteria 1 and 4, both for significant history, and for the building designs. The district has a high degree of integrity and includes residences, a rescue station, a lifeboat station, a crew ready room, a generator building, a capstan, a storm tower and flag locker, other support structures and the associated landscape. The period of significance is 1854-1932.

St. Mary's Fall Canal/Soo Locks was designated a National Historic Landmark in November 1966. A subsequent nomination prepared in 1977 identifies the exceptional importance of the property in demonstrating the development of commerce in the Northwest. Creation of the first canal opened the resources of the Lake Superior Region to national exploitation. In addition to the Erie Canal and the Illinois and Michigan Canal, the Soo Falls Locks was one of the most successful waterways in the ante-bellum era. The canals are also described as a prime example of the efforts of the Corps of Engineers in the preservation, maintenance and operation of numerous waterways which were and are such a vital force in the commercial life of the country. Its areas of significance are commerce and industry;

208 352 Brian J. Faltinson, "Split Rock Light Station" National Historic Landmark Nomination (2009), 19.

this translates to Criterion 1. The National Historic Landmark period of significance is 1837 – present. The historic district has a high degree of integrity and encompasses about 400 acres of canals, locks, operating and administrative buildings, in addition to two large parks

Each of these aids to navigation derive their national significance from their role in Great Lakes history. Each of these properties have a documented national significance related to important events in Great Lakes maritime history, and/or they are sites that are an outstanding example of an architectural or engineering design. In addition each site has the high degree of integrity necessary to meet the standard for National Historic Landmark designation.

Registration Guidelines

At the end of the nineteenth century J.B. Mansfield, employing the grandiose prose of that time, began his history of the Great Lakes by observing: “In the new world lies a cluster of inland seas, matchless in extent, about which has been growing for three centuries a new civilization, surpassing in splendor and in might the sea-grit empires of the past.” For Mansfield the waterway that stretched for more than one thousand miles from the heart of North America to Atlantic shores was essential to the story of American social and economic history. Although he devoted nearly two-thousand pages in two quarto-sized volumes to the subject, Mansfield still had to admit: “it is difficult to fully appreciate the debt which America owes her inland seas.” Writing at a time when a new American empire was being created in the Pacific and plans were maturing for a great Central American canal, Mansfield nonetheless argued that historically “the development of navigation on the Great Lakes” was far more “important.”³⁵³

In contrast, twenty-first century Americans, scholars and the general public alike, tend to overlook maritime history in general and the Great Lakes in particular. This dilemma makes it both difficult but all the more necessary to argue that events important in the history of the Great Lakes region are significant to United States history and indeed North American history. The size of the inland seas, the intimate role of the regional marine in enabling agriculture, industry, and urbanization, make the linkage of the regional story organic to national history. The significance statements from the three existing Great Lakes light station NHLs reflects this assessment. Therefore, this document argues that sites, districts, objects, structures that are linked to critical events in Great Lakes history, or which outstandingly represent important advances in Great Lakes maritime design, are of national significance. This is particularly true for those properties that are thematically and geographically linked in landscapes that reveal the range and diversity of maritime infrastructure. In addition, such properties and places must have a high level of integrity to meet the threshold for designation. Great Lakes maritime properties and places must have a direct and meaningful documented association with the broad pattern of regional development articulated in the context history and the themes identified by the National Park Service for interpreting American history. Finally, these properties

353 J.B. Mansfield, *History of the Great Lakes*, Vol. 1, (Chicago: J.H. Beers, 1899), 1-3.

and places must be evaluated against comparable properties associated with the theme study before its eligibility for landmark designation can be confirmed.

Discussion:

Chronological Period 1: *The role of navigation aids in the spreading a national communication and market revolution to the Great Lakes region in the period, 1789-1837.*

During this period, the federal commitment to aids to navigation, which was approved in one of the first Acts of the United States Congress, was haltingly expanded to the Great Lakes region. Lighthouses were the principle aids to navigation supported by the federal government in the Great Lakes region. Unfortunately, due to the incompetence of the Treasury Department personnel who supervised lighthouse construction and operation, early stations were poorly sited, built, and equipped. State governments, beginning with New York's Erie Canal, played a key role in integrating the remote Great Lakes frontier into the national economy through construction of artificial waterways linking the Great Lakes with the Hudson, Ohio, and Mississippi river systems. The location of the canals facilitated the settlement of the region by populations from the Northeastern United States and from Northern Europe. These regional developments were integral to the national trend that historians have alternately dubbed the "Market Revolution" or the "Communication Revolution." Based on the context provided in this study, this reports suggests that light towers, lighthouses, or light stations and landscapes from this period that are related to critical events, significant individuals, or which represent outstanding architectural design, be consider for National Landmark status.

Criterion 1 of the National Landmarks guidelines states that sites may be significant if they are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history. A Great Lakes light tower or landscape from this era may be eligible if it is an exceptional example of the role of the Great Lakes in the national communication revolution of the ante-bellum era.

Criterion 2 of the National Landmarks guidelines states that sites may be eligible if they are associated importantly with the lives of persons nationally significant in the history of the United States. Hence, a Great Lakes lighthouse or landscape that relate to the lives of individuals who have played a significant role in transforming the Great Lakes as part of a national communication revolution of the ante-bellum era may be eligible.

Criterion 4 of the National Landmarks guidelines states that sites may be eligible if they embody the distinguishing characteristics of an architectural type specimen exceptionally valuable for a study of a period, style, or method of construction. Therefore, a Great Lakes light tower, lighthouse or landscape may be considered for eligibility if its design characteristics are an exceptional example of the period of the communication revolution.

Chronological Period 2: *The role of Great Lakes navigation aids in the national conflict over internal improvements and sectional economic development, 1838-1866.*

This is an era when the need for navigational aids accelerated as the communication revolution begun in the 1820s led to rapid population growth, agricultural development, and urbanization in the Great Lakes region. While the number of light stations slowly increased during these years, their utility as navigation aids remained compromised until the creation of the Lighthouse Board in 1851. That change brought an immediate improvement in the utility of American lighthouses. Great Lakes navigation was also facilitated in 1841 by the creation of the United States Lake Survey to provide navigation charts for the inland seas. Despite these salutary developments and technical improvements to Great Lakes ship design, the development of the region and the lake marine was seriously retarded by the slow pace of improvements to Great Lakes harbors and connecting waterways. This issue was a significant element in the growing sectional conflict between the North, South, and West and which would threaten the very existence of the United States. The Civil War of 1861-1865 largely resolved the constitutional question of federal support for Great Lakes navigation and led to flurry of regional enhancements along the inland seas. Based on the context provided in this study, this report suggests that lighthouses and associated resources from this era that are related to critical events, significant individuals, or which outstanding represent influential architectural design, be considered for National Historic Landmark status.

Criterion 1 of the National Landmarks guidelines states that sites may be significant if they are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history. A Great Lakes light tower, lighthouse or landscape from this era may be eligible if it is an exceptional example of the role of the Great Lakes in the national communication revolution of the ante-bellum era or the improvement of lighthouses under the management of the Lighthouse Board and the expansion of federal navigation support in the wake of the Civil War.

Criterion 2 of the National Landmarks guidelines states that sites may be eligible if they are associated importantly with the lives of persons nationally significant in the history of the United States. Hence, a Great Lakes light tower, lighthouse or landscape may be eligible if it is importantly associated with an individual who has played a significant role in the national communication revolution of the ante-bellum era, the economic growth of the Great Lakes region, or the improvement of Lighthouse management under the Lighthouse Board.

Criterion 4 of the National Landmarks guidelines states that a site may be eligible if they embody the distinguishing characteristics of an architectural type or specimen exceptionally valuable for a study of a period, style or method of construction. Therefore, a Great Lakes light tower, lighthouse or landscape may be considered for eligibility if its design characteristics are an exceptional example of navigation aids developed during the last years of the Stephen Pleasonton administration of the Treasury Department or the new administration of the Lighthouse Board.

Criterion 5 of the National Landmark guidelines states that a site may be eligible if they are

composed of integral parts of the environment not sufficiently significant by reason of historical association or artistic merit to warrant individual recognition, but collectively compose an entity of exceptional historical or artistic significance, or outstandingly commemorate or illustrate a way of life or culture. National Landmark status may be warranted for a Great Lakes maritime cultural landscape developed in whole or in part during this era that retain exceptional integrity and that together exemplify design characteristics of aids to navigation during this period and or that outstanding represent the role of the Great Lakes in the national communication revolution of the ante-bellum era or the improvement of lighthouses under the management of the Lighthouse Board and the expansion of federal navigation support in the wake of the Civil War. Such a district may be a maritime cultural landscape that includes other period-relative and integral historic maritime resources associated with navigation, including harbors, piers, canals, shipwrecks, vessels or life-saving stations.

Chronological Period 3: *The role of navigational aids in the industrialization of the Great Lakes region, 1866-1945.*

This is an era in which the industrialization of the Great Lakes region played a major role in the national economy and the international conflicts of the second half of the nineteenth century and the first half of the twentieth century. The shipment of lumber, grain, iron ore, and coal on the inland seas led to the integration of the region into a northern natural resource frontier along the Upper Great Lakes and an urban/industrial complex along the southern margin of the lakes. The fortunes of late-nineteenth century titans of industry, such as John D. Rockefeller, Andrew Carnegie, and J.P. Morgan, were tied to Great lakes shipping. The growing professionalism and technical sophistication of the lighthouse establishment and its navigational aids were a critical part of the region's international economic and political significance. The high point of lighthouse development was attained on the Great Lakes, with future undertakings concentrated on improving existing sites and streamlining operations.³⁵⁴ Based on the context provided in this study, this report suggests that lighthouses and associated resources from this era that are related to critical events, significant individuals, or which outstanding represent influential architectural design, be considered for National Historic Landmark status.

Criterion 1 of the National Landmarks guidelines states that sites may be significant if they are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history. A Great Lakes light tower, lighthouse or maritime cultural landscape from this era may be eligible if it is an exceptional example of the role of the Great Lakes in the industrialization of the inland seas economy and the growing sophistication of the lighthouse establishment.

Criterion 2 of the National Landmarks guidelines states that sites may be eligible if they are associated importantly with the lives of persons nationally significant in the history of the United

States. Hence, a Great Lakes light tower, lighthouse or landscape may be eligible if it is importantly associated with an individual who has played a significant role in the industrialization of the region, the growth of its intra-regional trade, and its role in international conflicts.

Criterion 4 of the National Landmarks guidelines states that a site may be eligible if they embody the distinguishing characteristics of an architectural type or specimen exceptionally valuable for a study of a period, style, or method of construction. Therefore, a Great Lakes light tower, lighthouse or landscape may be considered for eligibility if its design characteristics are an exceptional example of inland seas navigation aids developed between the mid nineteenth century and the first half of the twentieth century.

Criterion 5 of the National Landmark guidelines states that a site may be eligible if they are composed of integral parts of the environment not sufficiently significant by reason of historical association or artistic merit to warrant individual recognition, but collectively compose an entity of exceptional historical or artistic significance, or outstandingly commemorate or illustrate a way of life or culture. National Landmark status may be warranted for a Great Lakes maritime cultural landscape that retains exceptional integrity and that whose contributing features together exemplify design characteristics of aids to navigation during this period and or that outstanding represent the role of the Great Lakes in the industrialization of the inland seas economy and the growing sophistication of the lighthouse establishment. Such a district may be a maritime cultural landscape that includes other period-relative and integral historic maritime resources associated with navigation, including harbors, piers, canals, shipwrecks, vessels or life-saving stations.

Chronological Period 4: *The role of the Great Lakes in the development of electronic and automated systems of navigation and navigational aids, 1920-2000.*

Because the fifty year rule—apart from rare exceptions—does not allow for the designation of National Landmarks less than fifty years old, navigational aids from the later portion of this era will require extraordinary national significance to justify potential listing. This era partially and necessarily overlaps with the growth of industrialization along the Great Lakes, but focuses on the rise of electronic and automated navigational aids and the growing sophistication of ship design and vessel piloting. This is an era of remarkable technological change in navigational aids as well as in the administration of lighthouses with the gradual transition of many stations from public to private ownership and the emergence of lighthouses as heritage sites significant to local and regional communities. Based on the context provided in this study, this report suggests that lighthouses and associated resources from this era that are related to critical events, significant individuals, or which outstanding represent influential architectural design, be considered for National Historic Landmark status.

Criterion 1 of the National Landmarks guidelines states that sites may be significant if they are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history. A Great Lakes light

tower, lighthouse or landscape from this era may be eligible if it is an exceptional example of the role of Great Lakes navigation in the application of new technology such as electrical lighting, radio beacons, or radar and/or if it was significant in the lighthouse preservation movement.

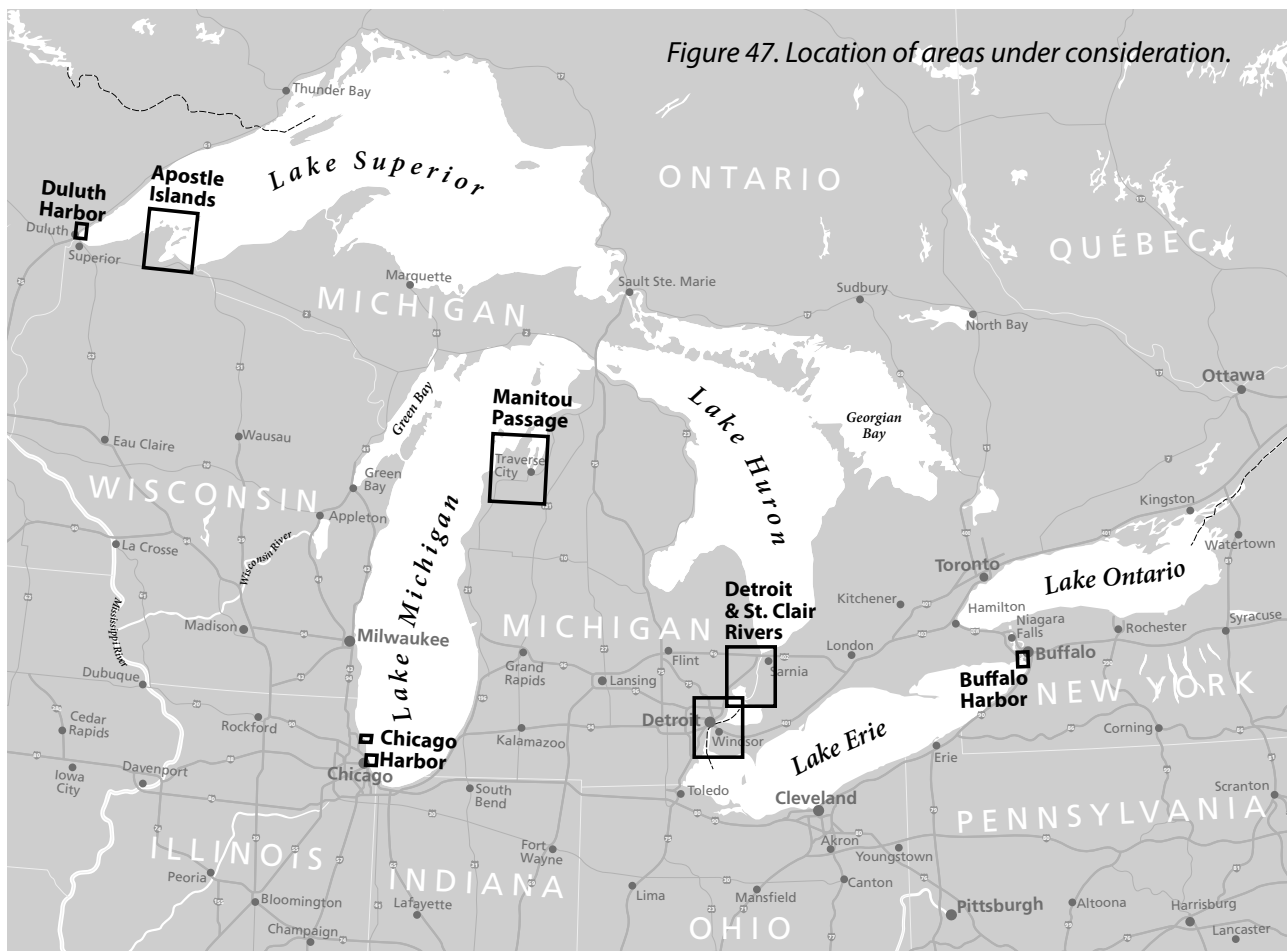
Criterion 2 of the National Landmarks guidelines states that sites may be eligible if they are associated importantly with the lives of persons nationally significant in the history of the United States. Hence, a Great Lakes light tower, lighthouse or landscape may be eligible if it is importantly associated with to an individual who has played a significant role in the evolution of lighthouse technology or light station preservation.

Criterion 4 of the National Landmarks guidelines states that a site may be eligible if they embody the distinguishing characteristics of an architectural type specimen exceptionally valuable for a study of a period, style, or method of construction. Therefore, a Great Lakes light tower, lighthouse or landscape may be considered for eligibility if its design characteristics are an exceptional example of how inland seas navigation aids adapted to new electronic based means of signaling and supporting the Great Lakes shipping. This may include light tower design and construction as well as the preservation of power systems, equipment, the arrangement of structures at a station, or the placement of a station within a system of navigation aids.

Criterion 5 of the National Landmark guidelines states that a site may be eligible if they are composed of integral parts of the environment not sufficiently significant by reason of historical association or artistic merit to warrant individual recognition, but collectively compose an entity of exceptional historical or artistic significance, or outstandingly commemorate or illustrate a way of life or culture. National Landmark status may be warranted for Great Lakes light towers, lighthouses or landscape districts developed during this era that retain exceptional integrity and that together exemplify design characteristics of aids to navigation during this period and or that outstanding represent the role of the Great Lakes in the application of new technology and/or if it was significant in the lighthouse preservation movement. Such a district may be a maritime cultural landscape that includes other period-relative and integral historic maritime resources associated with navigation, including harbors, piers, canals, shipwrecks, vessels or life-saving stations.

Recommended Great Lakes National Historic Landmarks

This section presents brief arguments in favor of the consideration of specific areas where historic navigation aids join with other maritime infrastructural elements to form a cultural landscape. By its very nature, a maritime landscape is the dynamic, evolving union of water, land, and history in the form of cultural resources. Economic, social, and cultural history, join with geographic and water features to tell a unique maritime story of shipwrecks, ghost towns, lighthouses, long beaches, and sugar sands. Forest succession, shifting dunes, evolving social mores, and new technological capabilities all interact to change the look of a landscape, a look that is never static, that is ever mutable. A maritime historic landscape is the sum of what human societies have left behind from their efforts to exploit and control an uncontrollable force, a great lake, river, or ocean. Maritime cultural landscapes recognize light stations were merely one aspect of an infrastructure developed to promote safe navigation.



Buffalo Harbor Maritime Cultural Landscape, New York

This landscape consists of the following contributing features: three navigation aids which span Buffalo's history as a major Great Lakes port, the breakwaters that allowed for the creation of an outer harbor for the city, and two industrial slips or canals which provided sheltered dockage adjacent to major industrial complexes. There is one non-contributing feature: a breakwater "bottle light" that was moved from its original location.

Historically Buffalo was one of the most important ports on the Great Lakes. In 1900 Buffalo was the third busiest port in the United States, trailing only Chicago and New York City. Buffalo was the eastern portal of the Great Lakes transportation system and the destination for a large percentage of all shipping from Chicago or Duluth. The Erie Canal terminated at Buffalo and from the time of its completion in 1825 until the opening of the St. Lawrence Seaway in 1959 Buffalo was a tremendously important maritime center. The proposed National Landmark Maritime Landscape includes three lighthouses: Buffalo Harbor/Buffalo Creek Main Light (1833), the Buffalo South Entrance Light (1903), and Buffalo Breakwater Light (1963). The protective structures included in the landscape consist of the Old Breakwater (1872-1894), North Breakwater (1900), South Breakwater (1897-1904), and the South Entrance Arm Breakwater (1898-1911), and finally the West Breakwater (1962).

The oldest contributing element in the Buffalo maritime cultural landscape is the Buffalo Harbor Main Light (c.1833). This light tower replaced the first lighthouse constructed on the Great Lakes, built at the mouth of Buffalo Creek in 1818 (in tandem with the Erie, Pennsylvania light). That structure was originally both poorly sited and constructed, and in 1826 Congress allocated funds for a new navigational aid. The opening of the Erie Canal (NHL, 1960), which revolutionized life and commerce along the Great Lakes, prompted the building of the new tower which has an 1833 date inscribed in stone on the lintel above the door. There is some evidence that the light station was functional as early as 1828. In any event, the sixty-eight foot tall stone tower stood sentinel at the end of a 1,400 foot pier through the rise and fall of Buffalo as one of America's most important port cities. The lighthouse marked the entrance into narrow and shallow Buffalo Creek, which served as the city's harbor until an outer harbor was constructed after the Civil War. Located at the terminus of the Erie Canal and the head of navigation on the upper Great Lakes, Buffalo dominated grain shipment and flour production. Its access to coal and iron ore also made it an important center for heavy industry. The opening of the St. Lawrence Seaway was a body-blow to all of these industries as much lake shipping by-passed Buffalo in favor of direct access to the Atlantic Ocean.

The lighthouse is a tapered sixty-foot tall octagonal tower built of limestone blocks and topped with an ornate lantern room. No keeper's quarters were initially built for the light as a dwelling for the old 1818 light still remained farther down the shore. A new dwelling was built in 1899, but it is no longer extant. The tower has long been a point of local pride. Shortly after it was first lit, a local newspaper boasted it was the "most perfect work of its kind on this side of the ocean and perhaps in the world."

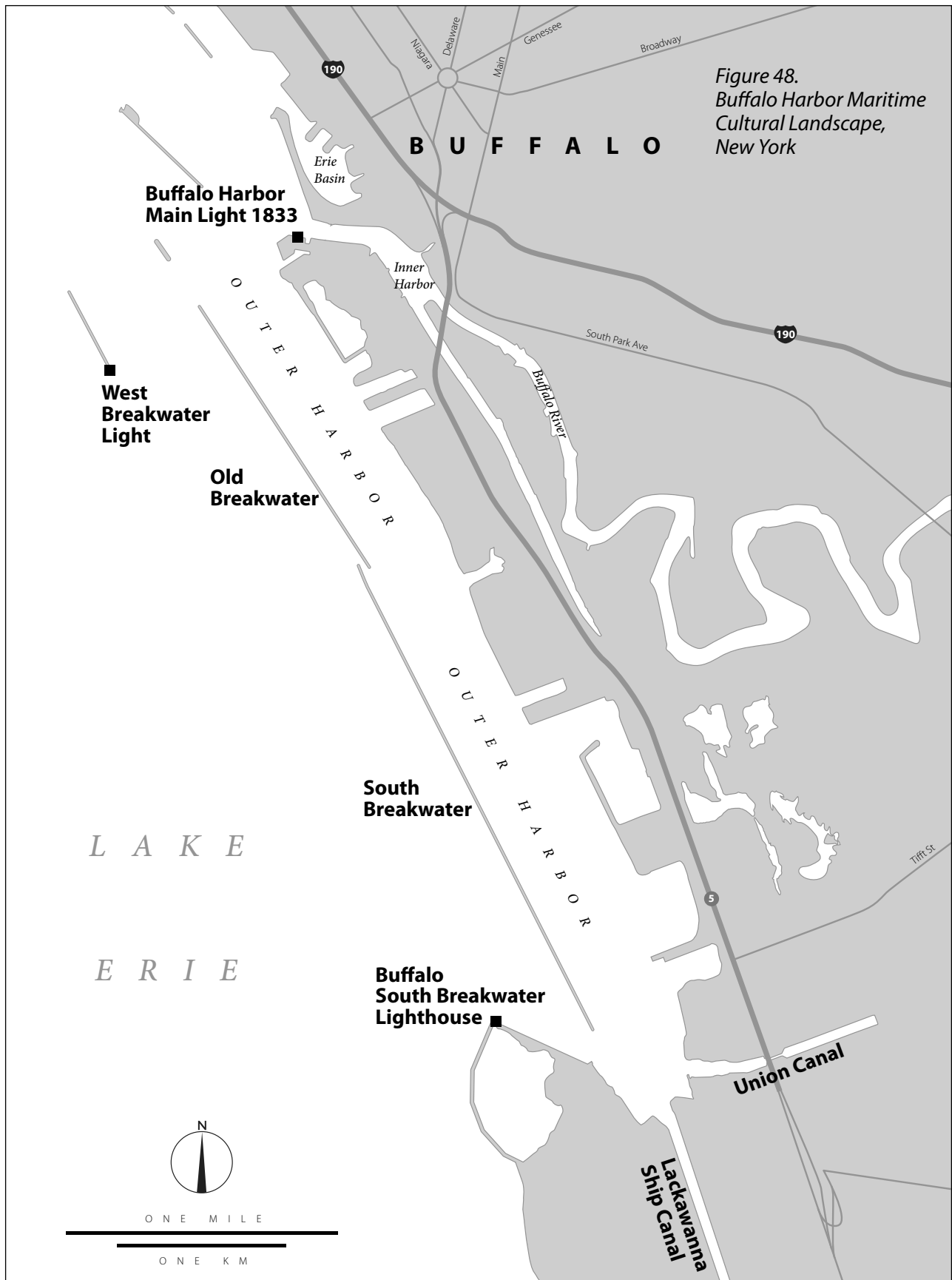




Figure 49. Ships safely anchored in Buffalo Outer Harbor, c.1910-1920.

Over the years, local support saved the tower from demolition, first in 1962 when the Army Corps of Engineers threatened it and again in 1984 when the Buffalo Lighthouse Association leased it from the Coast Guard and undertook a major restoration. This was followed in 2011 by a \$170,000 investment in preservation. Currently the lighthouse is part of an outdoor maritime museum. The old lighthouse is the oldest structure in Buffalo still standing in its original location. Local pride in this structure and the maritime heritage it represents is indicated by the prominent place of the lighthouse on the official seal of the City of Buffalo. The light tower was listed on the National Register of Historic Places in 1984.

As early as 1830 U.S. Army engineers predicted that the use of Buffalo Creek as the city's harbor would prove inadequate. An outer harbor was an obvious need by 1862 when better than 16,000 vessels entered or cleared the harbor. The system of breakwaters built by the United States Army Corps of Engineers eventually created a an outer harbor four and one-half miles long stretching from the head of the Niagara River to the tip of Stony Point, on Buffalo's old industrial south lake front. This is reputed to be the longest breakwater system in the world and its construction pioneered materials and techniques later used throughout the Great Lakes region.

The first outer harbor protective structure built was the Old Breakwater between 1868 and 1872.

218 Located roughly 3,000 feet from shore this structure extends north from the entrance to Buffalo

Creek (aka the Buffalo River). It was originally built by sinking wooden timber boxes or cribs filled with stone. The initial construction of this structure was bedeviled by the soft, muddy bottom of the lake which caused the stone cribs to sink and settle unevenly. Engineers struggled for more than two decades to solve the problem, which they managed only by rebuilding the entire 7,608 feet of the barrier with concrete. In 1896, two years after the Old Breakwater was completed it was further reinforced on the lake face by depositing stone riprap to fortify it against Erie gales.³⁵⁵

Upon completion of the first phase of work on the Old Breakwater a lighthouse was built twenty-three feet from its north end. Resting on a forty-foot square crib sunk into the lake floor the breakwater lighthouse was equipped with a fourth order lens and an attached wooden dwelling. Perhaps it needed a more powerful beacon because the breakwater lighthouse was repeatedly struck by passing vessels. After a steamer plowed into the light station in 1909 a new structure was ordered. Completed in 1914 the two-and-a-half story light station had a short light tower rising from the corner of the house-like structure. It served as Buffalo's main lighthouse until 1958 when the freighter *Frontenac* smashed into it and knocked to a severe fifteen-degree angle. The station was closed in 1962 when a new West Breakwater was erected. That breakwater was necessary because between 1959 and 1962 the Army Corps of Engineers created a 982 foot gap in the Old Breakwater and thereby created a new and better approach to the inner harbor. At the south end of the new West Breakwater the Coast Guard placed an automated seventy-one foot steel octagonal tower. Today this structure serves as Buffalo's main light.³⁵⁶

A separate North Breakwater that helped protect the entrance to the Black River was built between 1899 and 1901. It stretched for 2,204-feet and rested on stone cribs and was topped by a concrete and rock superstructure. At the south end of this breakwater a unique navigation aid was placed. Major Thomas W. Symons, engineer of the 10th Lighthouse District in Buffalo, took up the challenge of designing a low cost structure. He came up with a bottle shaped iron tower that rose to thirty-six feet above the lake and displayed a solid red light. Because it was painted white mariners took to calling it a "milk bottle" light. The light could be filled with enough fuel for five days so no on-site keeper was required and maintenance was performed by the crew of the Buffalo Main Harbor Light. The light was automated in 1955. In 1985 the Coast Guard removed the bottle light and it eventually was restored and placed next to the old Buffalo Main Harbor Light as part of an outdoor maritime museum.³⁵⁷

The South Breakwater was a more important and complex project. Stretching for 10,200 feet the South Breakwater is one of the longest in the United States. Completed in 1902 it allowed for a south entrance to Buffalo harbor. At the end of the breakwater a second bottle light was placed. This light remained on site until 1988 when it was removed. Today it is an exhibit at the Dunkirk Lighthouse and

³⁵⁵ United States Army Corps of Engineers, *Annual Report of the Chief of Engineers, 1951 Part 2* (Washington, DC: Government Printing Office, 1952), p.1943-1944; Drescher, *Engineers for the public good : a history of the Buffalo District*, p.155-169.

³⁵⁶ *Buffalo Light: Guardian of the Harbor*, <http://www.buffalohistoryworks.com/light/map.htm>, accessed September, 2016.

³⁵⁷ Buffalo North Breakwater, South Side Lighthouse, Buffalo, New York, 1903. *U.S. Lighthouses*, <http://www.us-lighthouses.com/displaypage.php?LightID=106>, Accessed September, 2016.



Figure 50. Lackawanna Ship Canal c.1968. Coke ovens on the right.

Veterans Park Museum. The main navigational aid for the new harbor entrance is the Buffalo South Entrance Light. It is a twenty-seven foot high steel tower located where Stony Point meets the South Entrance Arm Breakwater (1898-1911), which protects the south harbor entrance from southerly wind and wave action. Built in 1903 by the Lighthouse Bureau it was an important navigation aid for the heavy ship traffic that serviced the Lackawanna Steel Plant which for many years operated just inside the south harbor entrance. Rising from a foundation of stone and timber the new light was attached to a unique cone shaped fog signal built of curved iron trusses and concrete and displaying an eleven foot high sound reflector to project its signal out across the lake. A duplex keepers quarters was constructed nearby, but is no longer extant. This lighthouse was automated in 1962 and offered to the public in 2008. It is currently owned by the Buffalo Lighthouse Association.³⁵⁸

The lighthouse and breakwater complex allowed shipping access to two deep slips or canals, the Union Canal to the east and the Lackawanna Canal to the southeast. The Union Canal was the brain child of Charles W. Goodyear a Buffalo industrialist who wanted to enhance the ability of lake boats to bring coal, iron ore, and limestone access to the Buffalo & Susquehanna Iron Company, a company in which he had a major interest. The Union Canal was dug between 1899 and 1900 and its south bank

was once occupied by the Susquehanna Iron Company plant complex. The north bank of the canal was a coal terminal for the Pennsylvania Railroad. Today the area is clear of structures and is a recreational park. The Lackawanna Canal was built to facilitate the steel company of the same name which in 1900 relocated from Scranton, Pennsylvania, to the shore of Lake Erie to take advantage to Great Lakes shipping. The 3,937 foot-long canal was built in 1903 and dug to a depth of twenty-seven feet. The move from Scranton to Buffalo was part of a national trend to re-center the steel industry along the inland seas. For a brief time before the creation of the U.S. Steel Corporation, Lackawanna was the largest steel company in the world. In 1922 the complex was taken over by Bethlehem Steel Company which operated at the site until 1983. At its peak during World War II it employed 20,000 workers and it was the largest single steel plant in the world. Its blast furnaces and forges produced steel plate for ships, tanks, and other war materials. While this area is today virtually empty of structures, in the mid-twentieth century one of the densest concentrations of heavy industry in the world. As late as 1981 this Bethlehem Steel plant produced a record profit of more than \$8 billion dollars. Yet due to a failure to invest in new technology the plant was shuttered two years later. The Buffalo South Entrance Light and the Lackawanna Canal are eligible for NHL consideration under Criterion One because of their strong association with Great Lakes maritime history in the twentieth century and because of their direct association with World War II when the lakes were critical to the region functioning as the “arsenal of the heartland.”³⁵⁹

The Buffalo Harbor Maritime Cultural Landscape is potentially eligible for National Historic Landmark status under Criterion 1 as the embodiment of the city of Buffalo’s long and important association with the industry and commerce of the Great Lakes. These sites together reflect the role of navigation aids and navigational improvements in the spread of a national communication and market revolution to the Great Lakes region in the period, 1789-1839 (Context Period #1). The continuing role of Buffalo as a harbor and transshipment point reflects the role of navigation aids in the industrialization of the Great Lakes (Context Period #3). Drawing upon the “Light Stations in the United States” multiple property documentation form, the Buffalo Harbor Main Light also appears to meet Criterion 4 for its outstanding ability to reflect its original design. The proposed period of significance for this landscape is, 1833–1959, from construction to the opening of the St. Lawrence Seaway. This lighthouse connects strongly with the National Park Service themes of “Peopling Places” and “Developing the American Economy.”

359 Gerald L. Halligan, John Koerner, *Images of America: Lackawanna* (Charleston, SC: Arcadia Press, 2011), p.22-55.

Chicago Harbor Maritime Cultural Landscape, Illinois

During the nineteenth century, Chicago was the greatest and most important port on the Great Lakes. In 1871 it boasted more ships arriving and departing than New York, New Orleans, and San Francisco combined. Only in the early twentieth century did Duluth displace Chicago and become the greatest inland port. As late as 1900 Chicago ranked with New York, Hamburg, and Liverpool as one of the greatest ports in the world. As the most important maritime center on Lake Michigan—the only Great Lake completely in United States territory—and the site with the best waterway connection to the Mississippi Valley, Chicago harbor played a large role in the economic development of the American Midwest region. Three-quarters of all shipping on Lake Michigan originated in Chicago. Chicago's key transportation assets and the way maritime and rail transportation complemented each other in the city's economic development led historian William Cronon to dub Chicago "Nature's Metropolis." Yet Chicago harbor was a wholly unnatural product carved out of nature by United States and municipal government engineers. In particular the Lighthouse establishment and the U.S. Army Corps of Engineers made the town at the mouth of the Chicago River the metropolis it eventually became.³⁶⁰

The Chicago Harbor Maritime Cultural Landscape consists of the following contributing features: the Chicago Harbor Lighthouse, the Grosse Point Lighthouse, the historic Chicago Harbor Coast Guard Station, the Chicago River Lock Guidewall Light, and the Chicago Outer Harbor Breakwaters. Navy Pier is a noncontributing feature of the landscape because of alterations to its design, materials, workmanship, and original feeling.

Chicago's maritime infrastructure began inauspiciously when the first lighthouse commissioned for the town collapsed immediately after "passing inspection"—this shoddy construction was typical of the Stephen Pleasonton era. The current Chicago lighthouse has been more durable. It was erected in 1893 as part of a series of harbor improvements in preparation for the Columbian Exposition celebrating four-hundred years of American "progress." The building was designed to show the world the state-of-the-art in lighthouse design. Rising from a concrete base, the forty-eight foot cast-iron-plate tower has a brick-lined inner liner and a spiral staircase. Living quarters for the four keepers were enclosed on separate floors within the eighteen foot diameter tower. In 1917 Chicago's outer harbor was expanded with a new breakwater, and Congress allotted \$88,000 to move the lighthouse to this new off-shore location where it sits to this day. At that time, two support structures were added to the complex—a boathouse and a fog signal, thus creating a true light station. In 1925 the steam fog signal was replaced with an air diaphone. The fog signal was regarded by mariners as "the gol-darned best old horn on Lake Michigan," while Chicagoans living nearby complained it was "the damned-est outrageous nuisance and someone ought to hang for it." In 1925 the light was electrified, and in 1927 a radio beacon was added which allowed vessels twenty-miles-out to take a bearing on the harbor

222 ³⁶⁰ Karamanski, *Schooner Passage*, p.127-144; Larson, *Those Army Engineers*, p.105.

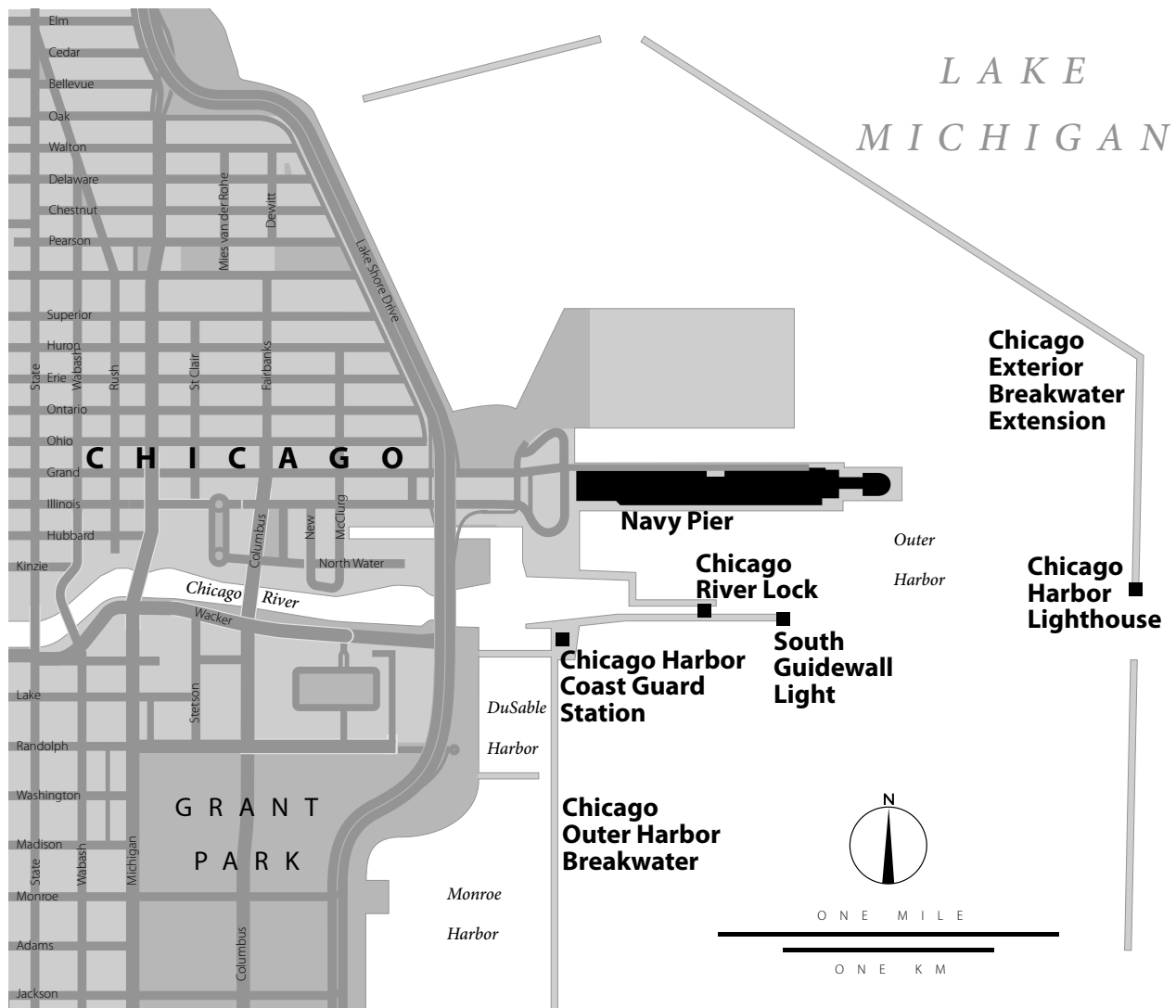


Figure 51. Chicago Harbor Maritime Cultural Landscape, Illinois.

entrance. The station was electrified but was not fully automated until 1979. The lighthouse is listed on the National Register of Historic Places and is a City of Chicago Landmark.³⁶¹

The Chicago Harbor Lighthouse is potentially eligible for National Historic Landmark status under Criteria 1 and 4. The proposed period of significance is 1893 to 1979, spanning the years from construction to automation. The Chicago Harbor Light played an important role in the history of one of the most important ports on the inland seas, illustrating the role of navigational aids in the industrialization of the Great Lakes region between 1870-1945 (context Period 3). Referencing the “Light Stations in the United States” multiple property documentation form, it may also be potentially eligible under Criteria 4 as an outstanding example of the evolution of lighthouse construction technology using cast-iron plate, and a caisson type foundation. Also now known as a “sparkplug” or “bug light” lighthouse it housed several living or working areas set one atop another. The appeal

361 Joanne Grossman and Theodore J. Karamanski, *Historic Lighthouses and Navigational Aids of the Illinois Shore of Lake Michigan* (Chicago: Chicago Maritime Society and Loyola University Public History Program, 1989), 34-35.



Figure 52. Chicago Harbor Lighthouse, 2008.

of cast-iron-plate was its prefabrication and ease of assembly. Relatively corrosion-resistant, able to withstand great compression loads, and capable of being cast into a variety of forms, cast-iron-plate was designed to be easily disassembled and re-erected as needed. Flanges on all sides of each plate were connected by bolts. Varying the size of the plates and number of courses determined the height and dimension of a light. The same design was used to build the cast iron cylinders to form the upper foundation of caisson lighthouses.³⁶² Cast iron lighthouses were not as structurally sound for exposed sites, but functioned well for secured headlands and harbor locations. The Chicago Harbor Light is distinctive due to its greater-than-usual height (for a Great Lakes light), and the attached hipped-roof boathouse and fog horn structures. Earlier examples of cast-iron plate exist, including the 163-foot tall Cape Henry Light (Virginia, 1880), the tallest light using cast-iron-plate. Such height was unnecessary for Great Lakes lights, and whereas the Cape Henry Light used flat plates, the Great Lakes lights of this type were usually designed in a conical or pyramidal shape, which compared to square towers, better resisted the lateral forces of driving winds. Cast-iron-plate lighthouses were built at a number of locations on the inland sea, such as the 1877 Menominee North Pier Light, the 1882 Frying Pan

³⁶² Candace Clifford, Ralph Eshelman, *et al*, *Historic Lighthouse Preservation Handbook*, (Washington, DC: National Park Service, Maritime Initiative, 1997), Part.ii, p.10; J.G. Barnard, "Lighthouse Engineering as Displayed at the Centennial Exhibition," *Transactions of the American Society of Civil Engineering*, Vol.8 (March, 1879), p.55-70.

Island Light, the 1884 Cheboygan Crib Light, the 1885 Detroit River Light, the 1885 Harbor Beach Lighthouse, the 1899 Waukegan Harbor Light, and the 1907 St. Joseph North Pier Inner Light. These are more modest examples of the construction style, in comparison to the Chicago Harbor Light. This lighthouse represents the National Park Service interpretive themes of “Peopling Places,” “Developing the American Economy,” and “Transforming the Environment.” The lighthouse has excellent integrity. Although it has been moved from its original location, this was done within its period of historical significance and as part of its mission as a harbor light, and reflects the design of the cast-iron-plate construction technology. The exterior of the structure was carefully restored in 1997 and the station is owned and maintained by the City of Chicago.

The second lighthouse in the Chicago landscape is located twelve miles north in the suburb of Evanston, Illinois. The Grosse Point Lighthouse was completed in 1873. It was designed by Orlando Poe then the engineer for the Upper Great Lakes Lighthouse District. The brick complex consists of a two-and-a-half story duplex dwelling linked via an above ground passage-way to the impressive 113-foot light tower. The height of the tower was in keeping with Poe’s post-Civil War coastal navigation beacons. This light was designed to orient vessels coming into Chicago from the north. The heavy volume of this traffic meant that many vessels had to approach from far off shore. Consistent with this purpose the lighthouse was equipped with a massive second order Fresnel Lens that sent its signal far across the waters of Lake Michigan. A terrible marine disaster in the fall of 1860 prodded Congress to authorize the Grosse Point Light. The steamer *Lady Elgin* collided with the lumber schooner *Augusta* while both vessels were laboring through heavy seas. The steamer quickly broke apart and more than 300 people drowned. The Civil War prevented any immediate response but in March of 1871 Congress voted funds to remove the “main light from Chicago Pier to Grosse Point, as a lake-coast light, and for putting a beacon range on the pier [at Chicago].” The Grosse Point Lighthouse then functioned for many years as the main lighthouse for Chicago until the Chicago Harbor Light was built in 1893. The Grosse Point Lighthouse complex was made a National Landmark in 1999.³⁶³

At the same time the Grosse Point Lighthouse was being built, federal authorities were planning major improvements to the Chicago Harbor. Army engineers first opened the Chicago River to ship traffic in 1834. They did this by building two parallel piers out from the mouth of the river. The piers impeded the formation of a sand bar where the river met the lake, a natural occurrence due to lake currents and the movement of sediment. The initial piers worked imperfectly and they needed to be extended on several occasions to ensure a clear entrance. Nonetheless, the Chicago River blossomed into the nation’s most important inland port. But in the 1870s traffic congestion in the river began to reach crisis dimensions. Every year in the nineteenth century the tonnage of cargo handled by the river-harbor increased and gradually so did the size of vessels engaged in the lake trade. In 1869 Army engineer Major Junius B. Wheeler proposed to create a protected anchorage outside the mouth

³⁶³ Donald J. Terras, *The Grosse Point Lighthouse, Evanston, Illinois: Landmark to Maritime History and Culture* (Evanston: Windy City Press, 1995), p.40-55.

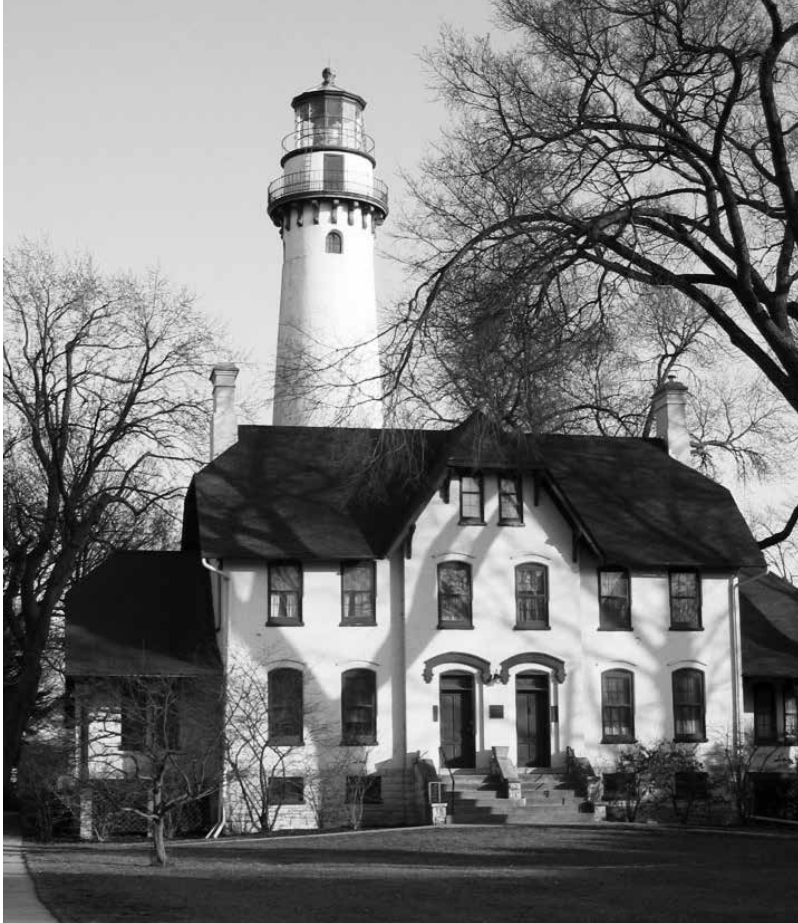


Figure 53. Grosse Pointe Lighthouse, 2006.

of the Chicago River. He proposed creating a sheltered area 455-acres in size including space reserved for piers and slips all of which would be made safe by constructing a 4,000-foot long breakwater. A year later a Congressional authorization of \$100,000 allowed the project to begin. The thirty-foot wide breakwater was constructed of stone-filled timber cribs on a stone base. When it was completed in 1875 mariners appreciated “the security of the anchorage to be found there.”³⁶⁴

With the creation of an outer harbor basin the mouth of the Chicago River became busier than ever. A number of business located on land created to the north of the river. As a safety measure in 1903 the United States Life-Saving

Service established a station on the breakwater wall. It was a Cape Cod style structure with a shingled exterior, a three-story watch tower, and four large boat bay doors that facilitated the launch of rescue boats. When the United States Coast Guard was formed in 1915 it inherited this facility. A fire devastated the structure in August 1933. A major reconstruction was completed in 1936. The Cape Cod/Colonial Revival style was kept with a shorter octagonal watch tower, clapboard siding replaced the shingles, and the north and south elevations featured a gabled ends. This structure underwent a major restoration in 2005 and is currently listed as a City of Chicago Landmark. It is a contributing feature to the landscape because of its long role in marine safety and its evocative marine architecture.

As early as 1878 army engineers argued that a second breakwater system was desirable. This exterior breakwater would be located nearly a mile north and east of the river mouth. The new work would provide a second line of protection from lake storms resulting from 300 miles of open water able to build into a powerful storm surge. The new breakwater would also create a much larger outer harbor that could in time replace the Chicago River as the main destination of ship traffic. Construction of



Figure 54. Location of Grosse Point Lighthouse in Evanston, Illinois, twelve miles north of the Chicago River.

this exterior breakwater, however, was only partially funded. In 1889 the army engineers created a thirty-foot wide a stone-filled timber crib breakwater resting on a stone base which extended 5,321 feet on a northeasterly angle. Because the city of Chicago dithered on whether they intended to build the piers and slips necessary to utilize an enlarged outer harbor the federal government did not complete the new breakwater complex until 1917. At that time it added a 2,227-foot-long southerly extension. It was at this time that the Chicago Harbor Light, that had been constructed in 1893, was moved to guard the entrance passage through the exterior breakwater.³⁶⁵

The exterior breakwater extension was undertaken because Chicago finally built an outer harbor docking facility. For years the city was torn between a lakefront that would be dedicated to shipping and rail roads and one that would be an attractive amenity for the recreation of the urban masses. Daniel Burnham's famous 1909 Plan of Chicago called for two lakefront piers but not the railyards that were needed for a functioning port. Instead he seduced the public with marvelous water colored images of lake front parks. In 1915 Chicago opened Municipal Pier, a 3,300 foot-structure that was designed to be both a terminal for the passenger-packet boats that crisscrossed Lake Michigan and a place for lakefront entertainment. The facility was renamed Navy Pier in 1927. Lacking effective railroad connections it was not a useful commercial facility. Even passenger ship companies were reluctant to use it as the Chicago River with its downtown frontage was more accessible to their clientele. Over the years the pier was used for many miscellaneous functions. It was a training center for the Navy in World War II and a campus of the University of Illinois in the 1950s. Hopes that the opening of the St. Lawrence Seaway in 1959 would signal a rebirth of shipping to the outer harbor were stifled after only a few years. The pier suffered from deferred maintenance and a lack of purpose

365 Elliot Flower, "Chicago's Great River-Harbor," *Century Magazine*, Vol. LXIII, No. 4 (February, 1902), p.483-92.

through the 1960s and 1970s. The prospect of a recreational revival blossomed in the 1980s and between 1989 and 1995 a major reconstruction took place that resulted in the destruction of many of the old commercial terminal facilities. These changes resulted in the pier losing its National Register status. It did, however, become the number one tourist destination in the Midwest region. Because of these changes and a new wave of construction currently underway, Navy Pier is a non-contributing, if nonetheless prominent feature in this maritime landscape. It should be noted that the Pier Head House and the East End Building, the most prominent elements of the structure are original and are official City of Chicago Landmarks.³⁶⁶

In 1906 army engineers covered in concrete the north pier at the mouth of the Chicago River. A new cylindrical forty-one-foot high cast-iron light tower was placed near its end. Approximately eighty yards further out on the pier a twenty-eight-foot steel tower was installed as a range light. The front range light remained in place until 1938. The cylindrical tower remained into the 1950s when it too was removed.³⁶⁷

In 1930 a new configuration of the mouth of the Chicago River was ordered by the United States Supreme Court. A generation before, in 1900 the City of Chicago constructed a deep water canal between the South Branch of the Chicago River and the Illinois River. Called the Sanitary and Ship Canal the waterway's dual purpose was to facilitate river traffic to Chicago and to solve a serious health problem. Chicago ran its sewers directly into the Chicago River. That river emptied into Lake Michigan, the source of drinking water for more than two million people. To prevent the river from polluting the lake Chicago dug a canal deep enough to reverse the flow of the river. After 1900 Chicago was taking millions of gallons of water per day out of the Great Lakes to send its filth to the Mississippi Valley. Naturally downstream cities like St. Louis launched legal protests but so did Great Lakes communities and Canada who rightly feared a lowering of water levels. The 1930 Supreme Court order resulted in Chicago building a lock at the end of its harbor piers to limit the amount of water it stole from the lake. These changes lead to two additional elements in the Chicago maritime landscape.

The Chicago lock was originally built between 1936 and 1938 by the Metropolitan Sanitary District which operated the Sanitary and Ship Canal. The lock chamber is 600 feet long, eighty feet wide and twenty-two feet deep. The lock is a non-contributing feature to the landscape because the control house was replaced with a post-modern structure in 2007 and in 2011 new lock gates were installed thereby compromising its integrity of design, materials, and workmanship. The lock however, is a vital feature of the Chicago Harbor. It is the United States' fourth busiest lock for commercial traffic and second busiest for recreational boating.³⁶⁸

366 For a detailed history of the ups and downs of the pier see: Douglas Bukowski, *Navy Pier: A Chicago Landmark* (Chicago: Metropolitan Pier and Exposition Authority, 1996).

367 Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, p.274.

368 United States Army Corps of Engineers, "The Chicago Harbor Lock" <http://www.lrc.usace.army.mil/Portals/36/docs/navigation/ChicagoLock.pdf>, accessed, September 2016.

A contributing feature of the maritime landscape is the Southeast Guidewall Light that serves as a navigational aid for vessels seeking to enter the Chicago River lock. Originally this enclosed white and green steel thirty foot high tower served as the Kewaunee Pierhead Lighthouse in Wisconsin from 1912 to 1931. In place in Chicago since 1938 this lighthouse still serves a critical function for thousands of recreational boaters who lack sophisticated navigational equipment and rely upon this beacon to find their way off of the lake.

The collection of maritime cultural resources arrayed along the Chicago and Evanston, Illinois, lake shore document a landscape that has been critically important in American and Great Lakes history. Chicago, the third largest city in the United States, was born as a maritime center. Before interstate highways, before railroads, it was sidewheel steamers and white-winged schooners that brought people and products to the city. The ensemble of lighthouses, breakwaters, and coast guard stations that make up this landscape were all created to facilitate one of the major ports on the inland seas and were part of the transformation of that port from an emphasis on commerce to recreational boating. This landscape documents in an outstanding way National Park Service interpretive themes “Peopling Places,” “Transforming the Environment,” and “Developing the American Economy.” The continuing role of Chicago as a harbor and transshipment point reflects the role of navigation aids in the industrialization of the Great Lakes (Context Period #3). The proposed period of significance for this landscape is, 1871–1938, from the construction of the Grosse Point Lighthouse to the New Deal–era additions of the Chicago River lock and lock guide wall lighthouse.

Manitou Passage Maritime Cultural Landscape, Michigan

The Manitou Passage is one of the oldest and busiest shipping lanes on the inland seas. Located in the northeastern reaches of Lake Michigan it is a passage seven miles wide between the Manitou Islands and the high sand dunes of Sleeping Bear National Lakeshore. The passage extends for thirty miles, from Point Betsie lighthouse to the town of Leland and it is entirely within the State of Michigan.

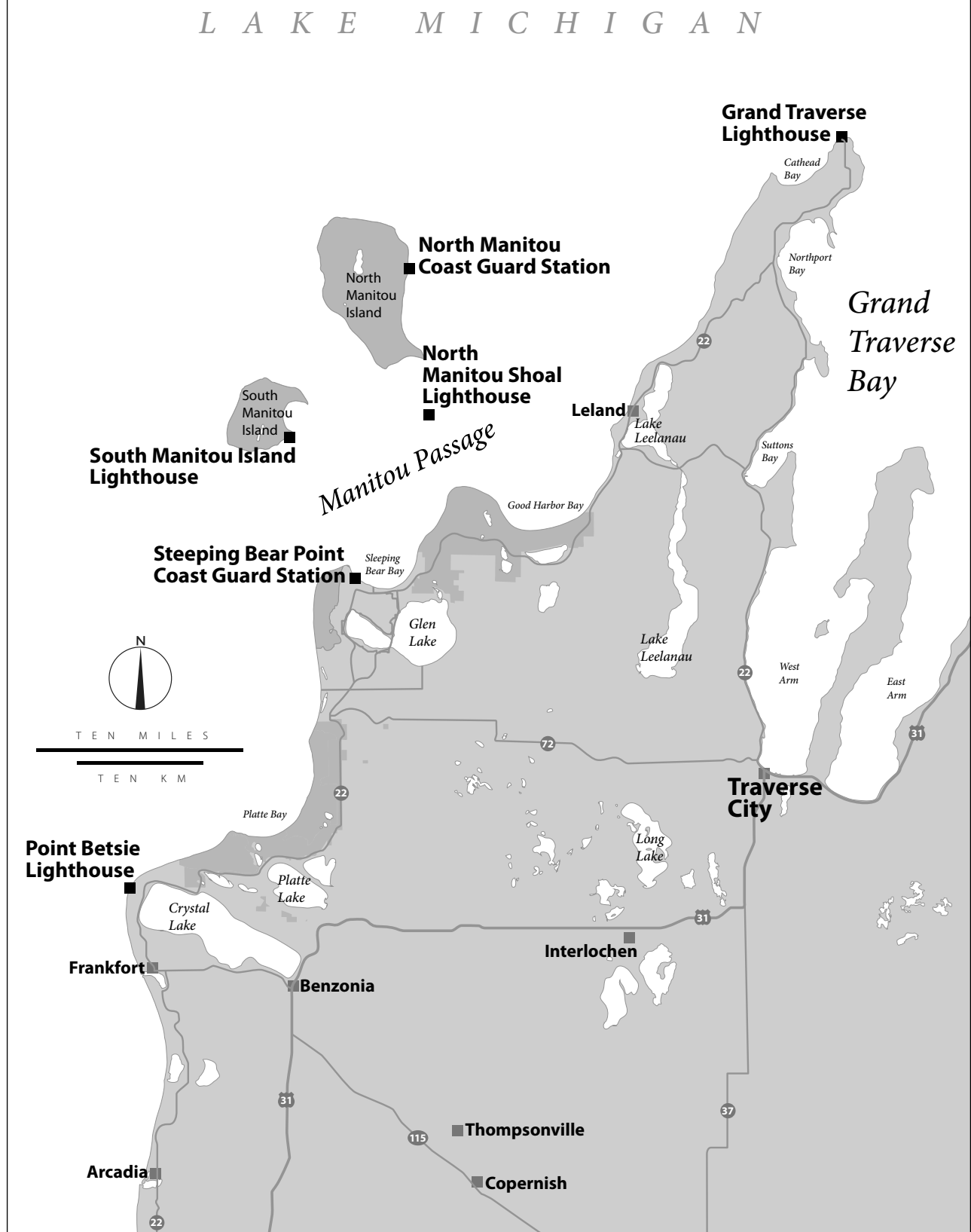
This cultural landscape consists of four lighthouses: Point Betsie, South Manitou Island, North Manitou Shoal, and Grand Traverse, all of which are contributing features. Also contributing features are three U.S. Life-Saving Service Stations/U.S. Coast Guard Stations: Sleeping Bear Point, South Manitou Island, and North Manitou Island. These sites together document the story of the navigational improvements that made the Manitou Passage a safe avenue for commerce.

The passage between the Manitou islands and Leelanau Peninsula presents to mariners both an opportunity and a hazard. The passage offers the shortest route between the mouth of Lake Michigan and the major ports at the head of the lake, Gary, Milwaukee, and Chicago. The passage also offers a sheltered route through the northern portion of the lake. Indeed, Crescent Bay on South Manitou Island is probably the finest harbor of refuge on Lake Michigan, a body of water notorious for its lack of natural harbors. The Manitou Islands are the southernmost extension of the Lake Michigan Archipelago, a collection of ten large islands. A ship taking the Manitou Passage effectively passes in the lee of the entire archipelago, which solves a tricky navigation problem and affords the vessel shelter from common northwest winds. The passage, however, is not without its risks. While seven miles of open water separate the islands from the peninsula, shoals constrict large ships to a narrow mile wide deep water channel. Strong currents sometimes flow through the passage. Fog, foul weather, and the lack of leeway for ships further add to the risks of the passage. The bones of some twenty vessels have been discovered within the passage and the remains of perhaps another sixty await rediscovery.³⁶⁹

The first known use of the Manitou Passage was by Anishinaabe canoeists. Odawa and Ojibwe families living in the Little Traverse and Grand Traverse Bay areas used the passage to reach hunting grounds in Lower Michigan and northern Indiana and Illinois. In 1887, Andrew Blackbird, an Odawa man who participated in the annual canoe voyages recalled how in his youth the entire family set out in vessels made of white birch bark. From the late seventeenth century into the early nineteenth century Europeans and European-Americans led flotillas of canoes through the passage from Mackinac, the great entrepot of the fur trade at the mouth of the lake. The massive sand dunes that jutted out into the lake were well known landmarks to all Lake Michigan voyageurs and as early as 1688 they appeared on French maps of the inland seas. The initial sailing ships to make use of the passage were attached to the fur trade. It is likely that the first vessel to make use of the passage was the schooner *Archange* which in 1778 was dispatched from its home port at Mackinac to gather Indian corn to feed the

³⁶⁹ Manitou Passage Underwater Preserve, Michigan Underwater Preserve Council, 2004, <http://www.michiganpreserves.org/Manitou.htm>; There is no definitive estimate of the number of shipwrecks that have occurred within the passage. Many recorded ships that were driven ashore were later refloated while the remains of unknown vessels have been revealed by the shifting dune sands.

Figure 55. Manitou Passage Maritime Cultural Landscape, Michigan



soldiers and traders at the straits. A year later, the forty-five ton sloop *Felicity* was sent on a similar mission. *Felicity* was the first of many ships whose master's chose to lie up for the night in the spacious confines of South Manitou Island's Crescent Bay, when faced with the prospect of making their way through the dark dangerous passage. The first American built ships to use the passage were the 150-ton brig *Adams* and the smaller sloop *Tracy*.³⁷⁰

Following the opening of the Erie Canal in 1825, the number of sailing ships using the passage greatly increased. It was via sailing ships and later steamships that the states of Michigan and Wisconsin, as well as the northern parts of Illinois and Indiana, were first settled. Fish, lumber, and farm produce were the first products produced along the blue water frontier. Future cities like Milwaukee, Manistee, Grand Haven, and Ludington were founded when schooners arrived off shore with shiploads of settlers. It is not too much to say that ships were the covered wagons of the region and the Straits of Mackinac and the Manitou Passage were the equivalent of the Cumberland Gap. As early as 1838 wooding stations were established along the passage to serve the needs of the steamboats. William N. Burton, a relocated Vermont farmer, established the first one on South Manitou Island. A federal official who visited South Manitou Island in 1838 stated "all the steamboats sailing on the upper lakes visit this place for a supply of fuel." Manitou Passage wooding stations were later established also at North Manitou Island, Good Harbor, Port Oneida, and Glen Haven.³⁷¹

The first navigation aid available within the Manitou Passage was a simple wooden lighthouse erected on South Manitou Island in 1840. The critical shelter provided by Crescent Bay made a lighthouse at this location invaluable to all ships using the passage. The rubble stone lighthouse with a short tower rising from the roof was wholly inadequate to the needs of shipping. The Lighthouse Board recognized this and replaced the original lighthouse with a brick two-and-a-half story "school-house" style structure. Unfortunately its fourth order Fresnel lens was still not adequate to the needs of vessels moving up the long reach between Point Betsie and South Manitou Island. This critical site was not adequately serviced until 1870 when Major Orlando Poe designed a graceful 104-foot brick tower. Unlike Grosse Point Lighthouse, another Poe tall tower, the South Manitou Light was not attached to a dwelling. Securing a firm foundation for the massive structure in the sand soil at the south end of the island was an engineering challenge that Poe met by driving oak beams deep into the earth and then topping those with a masonry foundation fifteen feet deep. The lighthouse was abandoned in 1958 after a radar-reflecting buoy was placed off the tip of the island. The lighthouse has been restored by the National Park Service and is part of the Sleeping Bear National Lakeshore park unit.

In 1850 a second lighthouse was added to the passage. Located near Cathead Point the structure was typical of the shabby navigation features built during Stephen Pleasonton's administration of

370 Milo M. Quaife, "The Royal Navy on the Upper Lakes." *Burton Historical Collections Leaflet* 2, no. 5, (1924): 49-64.

371 Brenda Wheeler Williams, Arnold R. Alanen, and William H. Tishler, *Coming Through With Rye: An Historic Agricultural Landscape Study of South Manitou Island at Sleeping Bear Dunes National Lakeshore, Michigan* (Omaha: Midwest Region, National Park Service, 1996), 24-27; Kenneth J. Vrana, editor, *Inventory of Maritime and Recreation Resources of the Manitou Passage Underwater Preserve* (East Lansing: Michigan State University Department of Park, Recreation, and Tourism, 1995), part 3, p.20.



Figure 56. North Manitou Island Life-Saving Station.

the lighthouse service. It was poorly built, poorly lit, and poorly sited. In 1858 the recently created Lighthouse Board ordered the construction of a new facility that could both serve vessels navigating Grand Traverse Bay and those transiting the Manitou Passage. The Grand Traverse Light was a brick two-and-a-half story gable roofed structure topped by a seven-foot wooden tower with a fifth-order Fresnel lens. The “school-house” style structure has been added on over the years. In 1900 structure was expanded and divided so as to provide separate housing for an assistant keeper. In 1916 the Coast Guard made an additional alteration to allow for a larger and separate kitchen. An oil house and fog signal complete the complex. The light was electrified in 1950 and manned until 1972. After falling into disrepair the lighthouse was adopted by a local friends group and restored. Today it is part of Leelanau State Park.³⁷²

In 1858 the southern entrance to the passage received a navigational aid. At Point Betsie a two-story brick gambrel roofed dwelling was built with a thirty-seven foot high circular tower attached to its front. An oil house and fog signal were later added to the complex. In 1880 the Lighthouse Board recommended that the lighthouse be replaced with a hundred-foot tower similar to the Orlando Poe’s design on South Manitou, but Congress did not respond with an appropriation. Keepers stayed on at the 1858 structure until 1982, making it the last manned light station on the Michigan peninsula. Today the lighthouse has been wonderfully restored and is operated as a museum by the Friends of the Point Betsie Lighthouse. Just south of the light station a Life-Saving station was established in 1875. It originally included a boathouse with a tower and an attached keeper’s dwelling. On the adjacent ground were four wood-frame cottages for the surf men. The cottages no longer remain. A former

³⁷² Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, p.280-1.

Life-Saving station building survives but it does not appear to be the original structure or it has been heavily modified. This privately owned building is not included in the nomination.³⁷³

More than a generation later in 1898 a third Manitou Passage light was erected at the south end of North Manitou Island. This light was supposed to help ship captains avoid the shoals that extended out from the island. A fifty-foot wooden tower with a detached duplex keeper's dwelling was an active station until 1935. The site quickly deteriorated after that point. The tower collapsed in 1942—the result of high water which a decade later began to engulf the keeper's dwelling. Nothing but scattered debris marks the site today. The lighthouse on North Manitou did not effectively guide vessels around the shoal and in 1907 a lightship was placed in the channel to offer even better guidance. This too proved less than ideal as spring ice conditions often drove the vessel off its station. Finally, in 1935 the lightship was replaced with crib light built in twenty-six feet of water over the North Manitou Island Shoal. The compact facility consists of a two-story square steel keeper's house out of which rises a sixty-three-foot square steel tower which was given the fourth-order Fresnel lens from the old North Manitou lighthouse. Perhaps because of its remote but vital location, this lighthouse was one of the last on the lake to be automated. Keepers were not replaced until 1980. This structure is a contributing feature to the maritime landscape.³⁷⁴

There are three Life-Saving/Coast Guard stations in the Manitou Passage Maritime Cultural Landscape and they are all contributing features. The first life-saving facility was established on North Manitou Island. In 1854 a volunteer station was established on the island. The U.S. Treasury Department provided a life boat and Nicholas Pickard a local lumber man built a boat house following plans sent from Washington, D.C. His wood cutters constituted the volunteer crew. The boat house is a one-and-a-half story cedar frame structure seventeen by thirty-six feet in size with a large hinged door opening into the boat storage area. It has been restored to its original appearance. It is a unique structure as it is the only survivor of a national system of volunteer stations established in 1854 along the nation's coasts. In 1877 after the U.S. Life-Saving Service was created, a station was established on the island. The boat house structure built at that time followed formal plans designed in the capital by Francis W. Chandler. It is a two-story wood frame structure with clipped gable ends and ornamental bracketry under the eaves. The lake side gable features a second floor balcony that was used as a lookout. This structure has since been adapted to serve as a dormitory but retains a high degree of integrity. In 1887 a two-story cross gable wood frame keepers dwelling was built for the station. Several other smaller structures were added to the complex over the years. The North Manitou Station complex is already a National Historic Landmark as it is the only station that served continuously through the volunteer phase of life-saving, the U.S. Life-Saving Service era, and the Coast Guard era. The station was closed in 1938 and it's currently part of the Sleeping Bear Dunes National Lakeshore park unit.³⁷⁵

373 Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, p.316-7.

374 "North Manitou Shoal, MI," *Lighthouse Friends.com*, <http://www.lighthousefriends.com/light.asp?ID=714>, accessed September, 2016.

234 375 Kerry Kelly, *U.S. Life-Saving Service* (Empire, MI: Friends of Sleeping Bear, 2007), p.17-18.

The Sleeping Bear Point station was built in 1901 by the U.S. Life-Saving Service and after 1915 was managed by the U.S. Coast Guard. D.H. Day, the lumberman who tirelessly promoted the Sleeping Bear area, had long lobbied the Treasury Department to establish a Life-Saving station at a point where vessels could be observed that were traveling the passage from both the north and the south. That place was Sleeping Bear Point. Day even set aside land for the station, but for more than a decade no action was taken. Finally after two vessels stranded off the point in 1899, plans for not one new station but two were set in motion. One station was placed at Sleeping Bear Point the other on South Manitou Island. The identical stations were designed by a Manistee, Michigan, builder and consisted of a one-and-a-half story wood frame dwelling, a wood frame outbuilding that housed a privy and storage, and a boat house with an inclined ramp. Within a month of the opening of the station its crew rowed out to the relief of a distressed vessel. However, over time the Sleeping Bear Point site proved to be ill considered. Wind and wave action at the point impeded the launch of surf boats and the site was constantly threatened with burial by the shifting sands of the towering dunes. In 1931 the station structures were relocated. Teams of horses pulled the buildings a mile east to a new site inside Sleeping Bear Bay near the town of Glen Haven. The station continued to function until May, 1944. The station builds are in excellent condition having been restored by the National Park Service to serve as a museum and living history site.

The South Manitou Life-Saving Station first went on duty in 1902 just inside the southern end of Crescent Bay and near the lighthouse complex. The station's infrastructure was identical to that of Sleeping Bear Point save for the existence of a large dock which tended to make the station the hub of activity on the Island. This station was equipped with motorized surf boats and so it played a larger role in Manitou Passage emergencies than the Sleeping Bear Point crew which focused on patrolling the long beaches on the mainland and using radio to make reports to the crew on South Manitou. The Coast Guard maintained the station here until 1958. The complex of buildings are in excellent condition and are used by the National Park Service for staff housing and visitor orientation.

The Manitou Passage Maritime Cultural Landscape is a strong candidate for National Landmark consideration. All contributing features are either already on the National Register of Historic Places or are eligible, and the North Manitou Life-Saving Station has been listed as a National Landmark since 1995. The sites all have a remarkable degree of integrity thanks to their preservation by the National Park Service, the Michigan DNR, or a committed friends group. These properties and the adjacent waters of the Manitou Passage clearly met National Landmark Criterion #1 because of the area's long and critical role in Great Lakes maritime history from the eighteenth century to the present. The Manitou Passage maritime landscape ensemble illustrates Historic Context Period 2 and 3. The Manitou Passage also strongly illustrates the National Park Service interpretive themes of "Peopling Places" and "Developing the American Economy."

Detroit River Maritime Cultural Landscape, Michigan

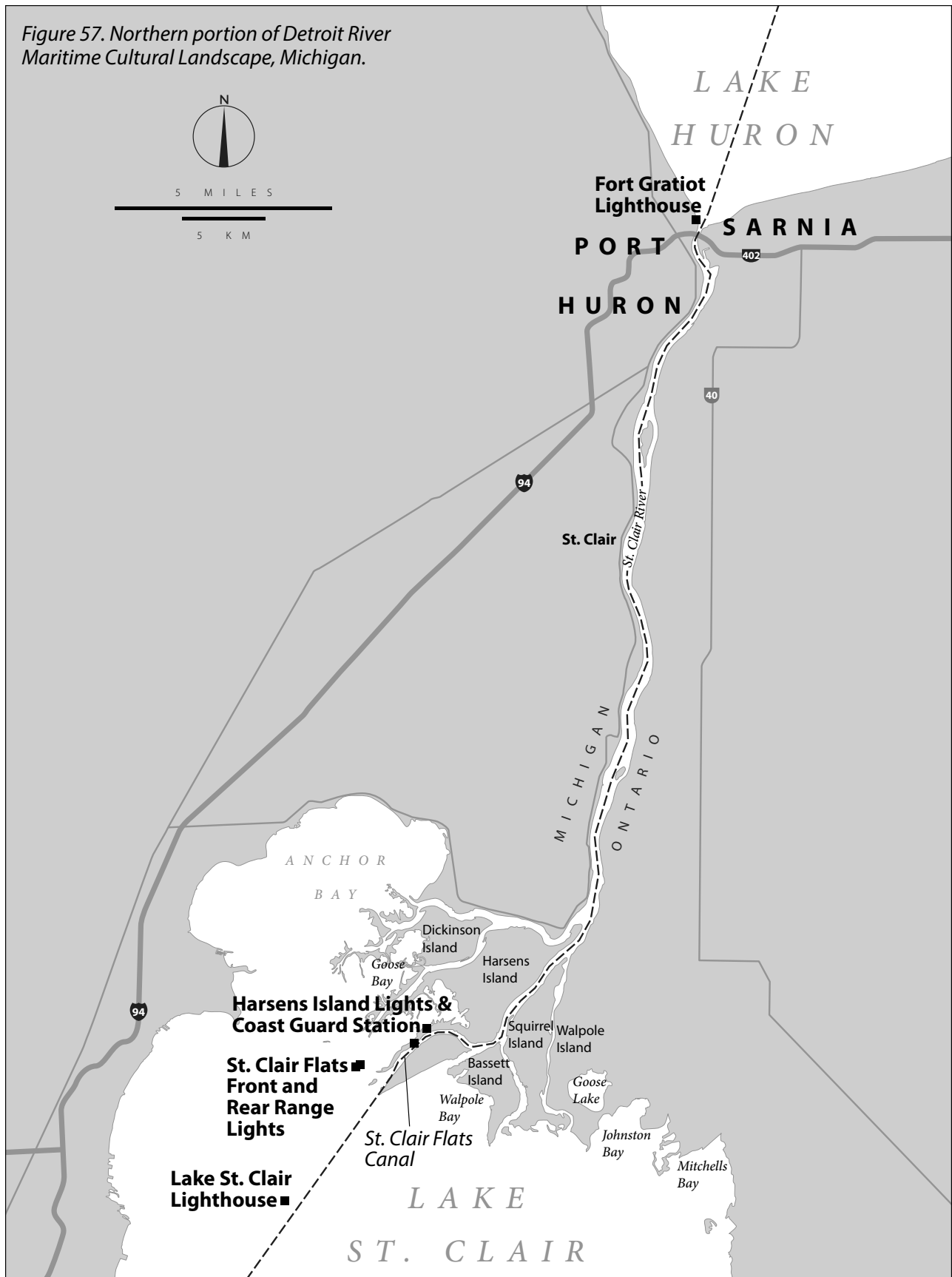
This potential nomination includes six historic light houses as contributing features. These are the Fort Gratiot Light Station on St. Clair River, an important tributary to the Detroit River; the St. Clair Flat Front and Rear Range Lights, the Livingston Memorial Lighthouse on Belle Isle in the Detroit River; the Grosse Ile North Channel Front Range Light, and the Detroit River (Bar Point) Lighthouse. Also included as contributing features are the Harsens's Island Lights and Coast Guard Station located in the St. Clair Flats. The Detroit Lighthouse Depot is also a contributing feature. Non-contributing features include the man-made channels of the St. Clair Flats Canal and the Livingston Channel in the Detroit River.

The Detroit River a twenty-four mile body of water which connects Lake Erie with the upper Great Lakes of Huron, Michigan, and Superior through the forty-mile long St. Clair River and Lake St. Clair. These waters constitute a "strait," as the flow of the upper Great Lakes passes through the narrow channel of these rivers. Indeed Detroit takes its name from early French explorer's perception of the area as a strait. Long before that time Indigenous Americans employed birch-bark and dugout canoes to navigate the waters between the Lakes Huron and Erie. In 1701 the French established a fortified trading post on the west bank of the Detroit River which they named Fort Pontchartrain du Détroit. This became the seed from which the metropolis of Detroit would grow. Following the completion of the Erie Canal in 1825, the Detroit-St. Clair River corridor became a heavily traveled choke point in the Great Lakes navigation system. Schooners which were the majority of the vessels on the lakes into the 1890s congregated at the head of the St. Clair River or the mouth of the Detroit River to await tug boats that would pull them through these confined waters and their shifting currents. When large steel steamers took over the lead in shipping these narrow congested waters became a navigational challenge. In 1907 67 million tons of commerce passed through these waters prompting the *Detroit News* to proclaim that the Detroit-St. Clair corridor constituted "the greatest commercial artery on earth."³⁷⁶

There are two critical locations on the Great Lakes which required significant civil engineering to facilitate unrestricted maritime travel on the Great Lakes and set in motion the expansion of inland seas commerce and the industrialization of the Great Lakes region: the St. Mary's Falls and the Detroit River/St. Clair Flats. The creation of the Sault St. Marie canal and lock system in 1855, and its numerous modifications, were critical to the passage of successively larger cargo vessels throughout the Great Lakes. The Sault St. Marie Canals have been recognized for their national significance in the 1966 National Historic Landmark nomination. The St. Clair Flats Canal and the Livingston Channel of the Detroit River are also major navigational improvements. However, because of major changes done to these structures since their first construction they are identified here as non-contributing structures due to issues of integrity.

236 ³⁷⁶ Jenny Nolan, "How the Detroit River shaped lives and history". *The Detroit News*, 11 February 1997.

Figure 57. Northern portion of Detroit River Maritime Cultural Landscape, Michigan.



Many major and minor navigational aids were developed in the early to mid-nineteenth century to facilitate passage through this critical strait. One important development was cutting a channel through the St. Clair Flats. Vessels had a very difficult time navigating a shallow, marshy stretch of water where the St. Clair River entered the lake of the same name. There were several narrow channels, but if a vessel became stranded on one of the innumerable shoals it often blocked the transit of scores of other ships. A naval officer visiting the spot in 1837 noted “These flats are dreaded by all persons, and are regarded as the most vexatious impediments they have to encounter. Vessels have been known to be two, and even three weeks in getting over them.” An attempt to solve this problem began with intermittent dredging between 1855 and 1865. A comprehensive solution was frustrated by President James Buchanan’s veto of a congressional authorization that would have created a safe deep passage. After the Civil War antifederalist constitutional objections to navigation improvements were swept aside and in 1871 a canal thirteen feet deep was pushed through the shallow water. By 1902 improvements included two channels, a dike and two range lights. Frequent channelization of the Detroit River occurred from the 1800s through 1968, driven by various River and Harbor acts. Arguably the most significant of these efforts was the creation of the 12-mile Livingstone Channel, begun in 1907 and completed in 1912. The initial goal was to create a safe channel for down-bound vessels and thereby prevent collisions with ships heading toward Lake Huron. This was a major undertaking with the United States Army Corps of Engineers building a series of coffer dams to drain a portion of the Detroit River and then blast out millions of tons of bedrock to deepen the bed of the river. The spoil from the blasting was placed along the side of the new channel as a dyke. The project was championed by the Lake Carriers Association who congratulated army engineers on “the largest and most expensive of any similar work ever undertaken by the United States within its boundaries.” Like the St. Clair Canal, however, this project was revisited each time Congress authorized a further deepening of Great Lakes navigation channels. Each time the channels were significantly altered. Unintended environmental consequences from the creation of this channel, and channelization of other areas of the Great Lakes, including the St. Clair Flats, have been contributions to changing lake levels, and the introduction of exotic species.³⁷⁷

Moving from north to south along the St. Clair-Detroit corridor the first lighthouse encountered, and the oldest, is the Fort Gratiot Lighthouse. In fact this is the oldest existing lighthouse in Michigan, the state with the most lighthouses in the United States. The original lighthouse at this site was built in 1825 under a contract given to Winslow Lewis. It was poorly situated and haphazardly constructed—typical of the work done under the Stephen Pleasonton regime of lighthouse administration. When

³⁷⁷ St. Clair Flats Range, MI, *Lighthouse Friends.com*, <http://www.lighthousefriends.com/light.asp?ID=706>, accessed, September, 2016; Noble Whitford, *A History of the Canal System of the State of New York with a Brief History of the Canals of the United States and Canada* (Albany, NY: Brondow Printing Company, 1906), p. 1421; David H. Bennion and Bruce A. Manny, “Construction of Shipping Channels in the Detroit River: History and Environmental Consequences,” *Scientific Investigations Report 2011-5122* (U.S. Department of the Interior, U.S. Geological Survey, Reston, Virginia: 2011) 1-10, <http://pubs.usgs.gov/sir/2011/5122/pdf/sir2011-5122.pdf>, accessed August 11, 2016; Tom Black, “Channel expansion made Detroit River safer for mariners,” *Soundings* (27 December 2012), <http://www.lre.usace.army.mil/Media/News-Stories/Article/491179/channel-expansion-made-detroit-river-safer-for-mariners/>, accessed September, 2106.

Figure 58.
Southern portion
of Detroit River
Maritime Cultural
Landscape, Michigan

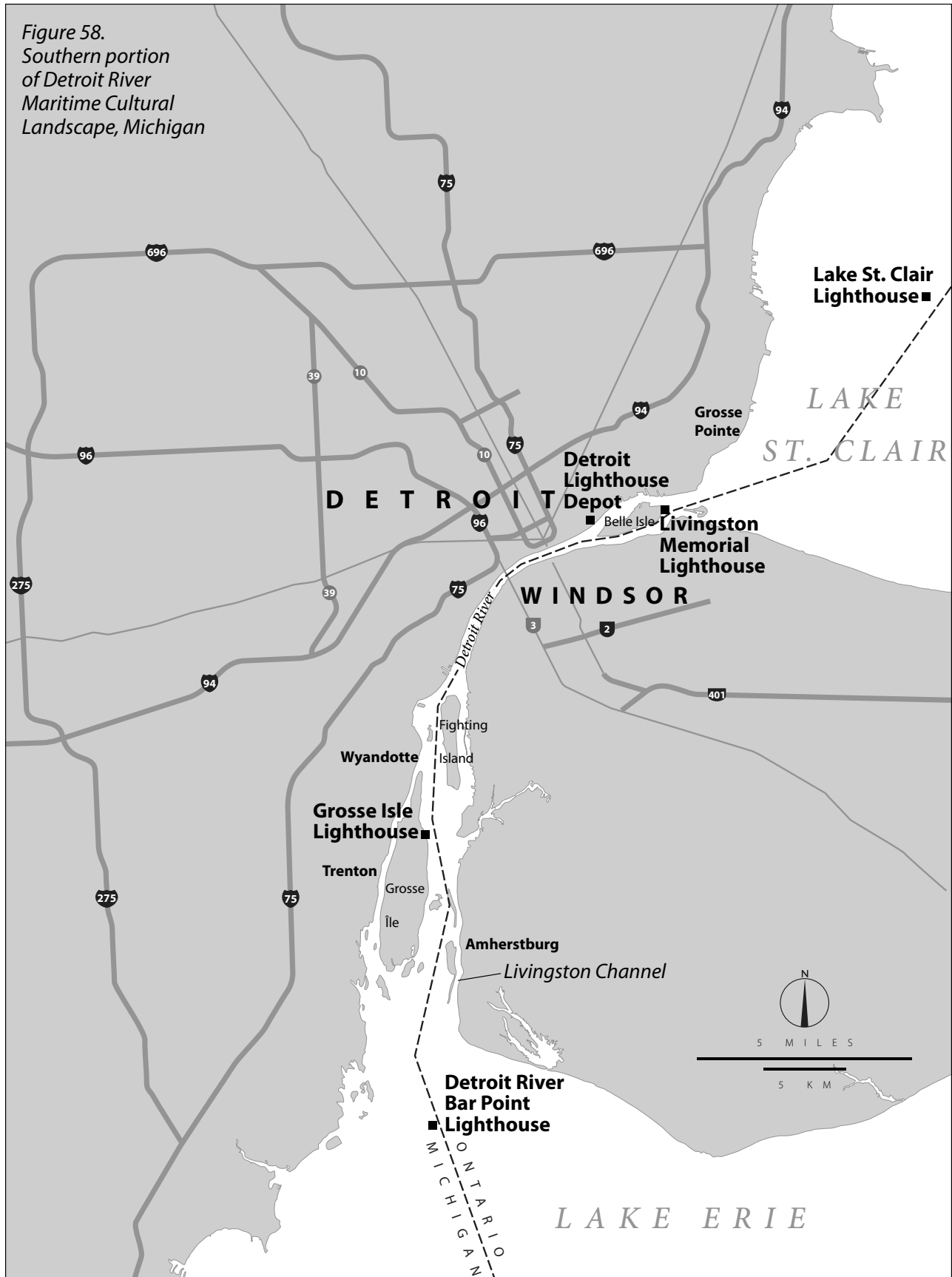




Figure 59. Fort Gratiot Lighthouse Station.

the original lighthouse collapsed only three years after it was built the Congress ordered a new tower to replace it. This time the job was given to Lucius Lyon who had a background in engineering and surveying. By December 1829 the sturdy structure that endures to this day was ready to begin service.

The free-standing conical brick tower originally was seventy-four feet high. However, in 1861 the Lighthouse Board ordered that a third-order Fresnel Lens be placed in the lantern room. To facilitate this this, modifications were made to the tower that included raising it to a height of eighty-six feet. In 1874 a brick duplex keeper's residence replaced the original wooden frame dwelling. Also part of the site today is a brick fog signal building built in 1901, and an oil house. In 1932 a Life Saving Station was built on adjacent land, in 1933, a home for the commander of the Life Saving Station was built. That same year, the tower was fitted with an Aerobeacon, and became fully automated. The great storm of 1913 that wrecked lake vessels and lightships across the inland seas nearly toppled the light tower. Steel pilings were driven into place to shore-up the foundation and a three-foot brick wall was installed to ward-off any future storm surge. Since 2011 the lighthouse has been administered by St. Clair County, Michigan, and the Port Huron Museum. They have worked to restore the entire complex of structures and it is open for public tours.

This light stationhouse has done service for nearly two hundred years. It contributes to this landscape nomination under criteria Criterion 1 of National Landmark guidelines because of its long role in Great Lakes navigational aid history and its association with the role of navigation aids in the national communication and market revolution in the Great Lakes region in the period, 1789-1839 (Context Period #1). It occupies a site that was long considered critical for navigation, transitioning from Lake Huron to the St. Clair River. The location was so important that it had necessitated the placement of an Army garrison. Improvements made to the light, and its evolution into a full light station, reflect the continuing importance of the light in the industrialization of the Great Lakes (Context Period #3). The structure did undergo Victorian era modifications. Because these changes occurred as part of the light stationhouse's continuing and important role in navigation in the nineteenth century this should not compromise site integrity. The Fort Gratiot Light Station represents the National Park Service interpretive themes of "Peopling Places," and "Developing the American Economy."

The Harsens's Island Lights and Coast Guard Station are the most recent contributing features in the maritime landscape. In 1871 two brick tower lights were constructed, one at each end, to mark the one mile long St. Clair Canal. When a new channel was dug in in 1906 both lights were demolished. In 1934 the Lighthouse Service built a light station on this island in the St. Clair Flats. It consists of a set of steel skeletal towers displaying electrical lights. They are set up as range lights for vessels passing the island from the north. The rear tower is set upon a hill and is 104 feet high. The front range light is a tower forty-four feet in height and is located adjacent to the former Coast Guard Station. The side of the skeletal towers facing the water is partially faced with white steel panels which serve as a day-mark. The Harsens's Island Coast Guard Station consists of several structures. In 1934 the Lighthouse Service built the one-and-a-half story keeper's dwelling in the Cape Cod style with an attached boathouse. Four years later a second similar dwelling was added to the complex to house an assistant keeper. These two dwellings and the range lights are contributing structures. A third house in the complex was added in 1970 when the Coast Guard purchased a previously constructed ranch house. This structure and an adjacent shed are non-contributing. The station was used only in the summers from 1985 until 1991. After that it was abandoned until 2013 when it was sold at auction to an individual interested in restoring the two Cape Cod dwellings which had endured more than a decade of neglect and vandalism. This station has the potential to contribute to the landscape nomination under NHL Criterion #1. The site documents an important transition in navigation aids to electrical lights, smaller lighthouse staffs, and the integration of light-keeping with general marine safety duties under the auspicious of the U.S. Coast Guard.³⁷⁸

Nearby Harsens's Island is another pair of range lights, two of the most durable on the Great Lakes. The St. Clair Flats Range Lights were constructed in 1859 to mark the South Channel out of the St. Clair River through the marshy flats and into the broad blue water of Lake St. Clair. The front

378 "Harsen's Island Saint Clair Flats Range Light Station Under New Ownership," *Lighthouse Digest* (March, 2013), <http://www.lighthousedigest.com/digest/StoryPage.cfm?StoryKey=1601>, accessed September, 2016.

range light is a seventeen-foot tall conical brick tower resting on a rock and timber crib. A 1,000 feet behind the front light was the rear range light, a forty-foot tall conical brick tower attached to a two-story brick dwelling resting upon a timber and rock crib. The opening of the St. Clair Flats Canal in 1871 reduced the importance of the two lights as most ships forsook the South Passage. Nonetheless, the lights remained in service. In 1875 ice damage threatened to topple the front range light and it was dismantled and re-secured on its crib foundation. In 1934 the two range lights were deemed obsolete and taken out of service. The abandoned dwelling was torn down that same year. The two light towers, however, somehow survived and were relit by the Coast Guard to service pleasure craft using the South Passage. In the 1980s the front range light again began to tilt as its foundation was undermined by winter ice. In the face of indifference by the Coast Guard a private group, Save Our South Channel Lights, rallied to save the leaning tower. They built a seawall around the tower to stabilize it. In 2005 the group funded a seawall to protect the foundation of the rear tower. Today the twin towers are owned by Save Our South Channel Lights and continue to function as active navigation aids. In 1990 they were listed on the National Register of Historic Places. These durable pre-Civil War lighthouses contribute to the maritime landscape through the continuity of their long service to the waterway. While the removal of the dwelling that had been attached to the rear range light compromises site integrity this significant change took place during the lighthouse's continuing service as navigation aids and therefore occurred within the period of significance that continues up to the fifty year cut-off. Indeed this change illustrates the St. Clair Flats Range Lights evolving role in the St. Clair-Detroit River transportation corridor.³⁷⁹

For vessels exiting Lake St. Clair and entering the Detroit River the large island known as Belle Iles narrows the navigation channel. A lighthouse was placed here in 1881. That structure was superseded by one of the most unique navigation aids in the United States. The Livingstone Memorial Lighthouse is different because it is one of the few privately built lighthouses in the United States, it is a memorial lighthouse, it is the nation's only marble lighthouse, and it was designed by one of the world's greatest architects. The structure was built in 1930 as a memorial to William Livingston, a Detroit-based capitalist with investments in newspapers, banking, and shipping. He was President of the Lake Carriers' Association and played a leading role in the expansion of the Sault Sainte Marie Canal with the opening of the Sabin Lock in 1919 and the building of the critically important Livingston Channel in the Detroit River for down bound vessels. This latter project (discussed above) was a huge undertaking which required the U.S. Army Corps of Engineers to build coffer dams to hold back a portion of the Detroit River while millions of tons of granite were blasted away. When the initial work was completed, it was named the Livingston Channel in honor of the man who had long championed the improvement. When William Livingston died in 1925, the Lake Carriers' Association and the people of Detroit raised money for a suitable memorial. The lighthouse was lit in April, 1930.

³⁷⁹ St. Clair Flats Range, MI, *Lighthouse Friends.com*, <http://www.lighthousefriends.com/light.asp?ID=706>, accessed September, 2016; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, p.121-2.



Figure 60. William Livingston Memorial Lighthouse, Belle Island, Detroit, Michigan.

Following its dedication by H.S. King Deputy Commissioner of Lighthouses the navigational aid was administered as a private aid to navigation. It marks the entrance to the Detroit River for ships leaving Lake St. Clair. Located on the landscaped park of Belle Isle in the Detroit River, the lighthouse is both uniquely beautiful and functional. Albert Kahn, America's greatest industrial architect, crafted a forty-seven foot fluted marble shaft topped by a bronze lantern which was initially fitted with a fourth-order electric power lens. During his long career, Kahn employed a broad range of utilitarian and historic styles. In the 1920s, however, he was much taken with the emerging Art Deco style. He employed this style most famously in his design of the twenty-eight story Fischer Building in downtown Detroit which in 1989 was declared a National Historic Landmark. The Livingstone Memorial Lighthouse is Kahn's other major Art Deco achievement. For both the Fischer Building and the lighthouse, Kahn featured extensive exterior sculpture by Hungarian master, Géza Maróti. The latter was a brilliant sculptor and artist who spent most of his career in Europe, save for a brief time in Detroit between 1927 and 1930 when he collaborated with Kahn and Eliel Saarinen. His contribution to the lighthouse is a relief of William Livingstone on the heavy bronze door to the structure and above the door a marble relief of a woman representing humanity and reliefs symbolizing wind, stars, and water all tamed by human ingenuity.³⁸⁰

380 "William Livingston Memorial," *Lighthouse Friends.com*, <http://www.lighthousefriends.com/light.asp?ID=163>, Accessed June 2016; Rebecca Binno

While the light is associated with a powerful lobbying group that exercised much authority over technological advancements on the Great Lakes, this aid to navigation may merit National Historic Landmark designation under Criterion 4 for its artistic merit as an outstanding example of the Art Deco style, and under Criterion Exception 7: “A property that is primarily commemorative in intent may be eligible if design, age, tradition, or symbolic value has invested it with its own national historical significance.” The significance of this commemorative property comes from its embodiment of the importance of the Lake Carriers’ Association in the history of Great Lakes navigation. Throughout the history of the region, from the time of LaSalle’s *Griffon* to the present, no private organization has played so important a role in shaping shipping on the inland seas. The property reflects National Park Service theme “Expressing Cultural Values.” The Livingston Memorial Lighthouse is one of the few memorial lighthouses and is the only marble lighthouse in the United States. The light also has played an important role in guiding navigation through Lake St. Clair and the Detroit River.

Grosse Isle is another island that restricts the navigation channel of the upper Detroit River. The original navigation aid placed in this vicinity was the Mama Juda Island Lighthouse in 1849. Later a series of range lights were placed on Grosse Isle, one set to aid vessel approaching from the south and a later set to help vessels approaching from the north. The south range lights were replaced with steel towers in 1962. The north range lights were modified in 1906, when the front light was rebuilt on a poured concrete foundation on a short pier in the Detroit River. The structure is a forty-foot wooden octagonal tower, which tapers upward in two stages, and is capped by copper domed lantern room. The use of the rear range light was discontinued in 1917 and it was destroyed around 1940. The Grosse Isle Front Range light was deactivated in 1963 and two years later acquired by Grosse Isle Historical Society who maintain the site today as a private navigation aid. This light is the only historic survivor of a series of lights that were critical to mariners for more than one hundred years. By itself it would not be eligible for NHL consideration but as a part of a navigational system it meets NHL Criterion #1. As such it is a contributing element to the St. Clair-Detroit River Maritime Cultural Landscape.³⁸¹

In 1882 Congress appropriated funds to build a lighthouse at the Bar River Shoal, a navigation hazard that had long plagued Great Lakes Shipping. Located near the mouth of the Detroit River the site had been subject to a dispute between the United States and Canada as to on which side of the border it was. For a time Canada had a lightship posted at the shoal. The station proposed by the Americans constituted such an obvious improvement that Canadian authorities agreed to move the border to allow for the permanent beacon. A timber crib filled with concrete was sunk into twenty-two feet of water. Granite blocks topped this and formed a hexagonal foundation for forty-nine foot cast-iron “spark-plug” style tower. A single story fog signal and radio beacon structure are attached to the tower. The light was automated in 1979. Set in the middle of the Detroit River the lighthouse has had its share of collisions and near misses. None, however, was more confounding than when it was hit by the powerful new laker

and Greg Kowalski, *Art Deco Detroit* (London: Arcadia Press, 2004) 11, 32-34.

M/V Buffalo in December 1997. On a clear day the *Buffalo* plowed right into the lighthouse causing over a million dollars in damage to its bow. The well-built lighthouse suffered only a bit of chipped stone.

One final structure helps to integrate the maritime landscape: the Detroit Lighthouse Depot. This structure was built between 1871 and 1874. It was part of a nationwide project funded by Congress to establish twelve lighthouse supply centers for the Lighthouse Service. The structure is a three story forty-foot by sixty-foot red brick edifice with a gabled roof. Designed by Major Orlando Poe, renowned for his lighthouse architecture during this period, the structure appears to be a blend of Romanesque and Italianate styles. Poe's design very much reflected the function of the building. A large basement was designed to hold lamp oil in a secure space. Here all the lighthouse lamp oil for the Detroit River, Lake Huron, Lake Michigan, and Lake Superior was stored. Each of the stories had reinforced floors to support heavy weight and to resist fire. Iron trusses on each level help the walls support this burden. Interior steel doors further enhanced the fire proofing. The Detroit Lighthouse Depot was a vital storehouse for upper Great Lakes navigation aids. Not only were all supplies stored here but a machine shop, lampist shop, and carpenter's shop undertook repairs of everything from rotation devices to lenses. At one time the grounds also included a storage shed and a dwelling for the depot custodian. An iron tramway led from these structures to the dockside. The depot played a vital role in Detroit River navigation. Every spring the numerous buoys that were so critical to safe passage through this strait were taken from the depot and placed where needed. Every winter most were taken up and repaired and repainted in the shops.³⁸²

The depot building is in excellent condition. The impressive front entrance to the depot is graced with an arched limestone lintel into which is carved the date "1871." The lintel is support by two limestone columns. On the south column is carved the name "Lt. Ho." While the north column displays "Depot." In 1996 the building underwent restoration by Albert Kahn Associates. It is currently owned by the Detroit Parks Department. The building has superb integrity with exterior and interior materials and workmanship intact. The structure is on its original site on the banks of the Detroit River adjacent to the current Coast Guard base. The structure is not listed on the National Register of Historic Places but as a contributing component in the Detroit River maritime cultural landscape the depot is worthy of NHL consideration under Criterion #1.

A number of historically important Detroit River light stations have been abandoned and destroyed, such as the Grassy Island Lighthouse, Gibraltar Lighthouse, and Mama Juda Lighthouse. However, the light structures that remain along this vital waterway and which still perform their original function represent a valuable collection of maritime history artifacts covering the span of time from 1829 to 1934. The Detroit Lighthouse Depot's superb preservation and historic setting combines with the surviving historic light stations to offer the public a marvelous ensemble of maritime cultural resources along one of the most important waterways in the United States. This landscape encapsulates Great Lakes Context Periods 1, 2, and 3.

382 Wayne Wheeler and Thomas Tag, "Lighthouse Depots," *United States Lighthouse Society*, <http://uslhs.org/lighthouses-depots>, accessed September, 2016.

Duluth-Superior Maritime Cultural Landscape, Minnesota, Wisconsin.

This maritime cultural landscape includes the following contributing resources: the 1858 Minnesota Point Light ruin; the 1901 ship canal and associated breakwater and pier; the 1901 Duluth South Breakwater Outer Light and Fog Signal building; the 1901 Duluth Harbor South Breakwater Inner Light; the 1910 Duluth Harbor North Pierhead Light; the original 1873 Keeper's Dwelling and the 1913 Brick Duplex ; the 1913 Superior Entry Breakwater Light and Breakwaters and Piers; and two Keepers Dwellings associated with the Superior Entry Breakwater Light, built in 1893 and 1916; the 1905/1930 Aerial Lift Bridge; the Duluth Buoy Depot; the Corps of Engineers Administration building; and the Duluth-Superior breakwater system.

Duluth-Superior Harbor straddles the Minnesota and Wisconsin border, and is created by a ten mile long sand bar that separates Superior Bay and the harbor basin from the vast expanse of Lake Superior. The natural entry point to the harbor was a narrow opening in the sand bar on the Wisconsin side of the border and known as Superior entry. The first navigational aid in this area was a lighthouse placed here by the United States government in 1858, its construction authorized in 1854 in anticipation of the completion of a canal and lock system at St. Mary's Falls. It was replaced and abandoned in 1885, and is today a badly deteriorated ruin. The Superior entry was modified over time to accommodate maritime travel, with the creation of piers, a light tower and a fog signal building, by 1893. A second entry point through the sand bar was created by the citizens of Duluth in 1872 to provide direct access to Duluth, Minnesota, via a short ship canal. This was followed by a breakwater, a wood frame light, fog signal building, and a keeper's dwelling, built by the Lighthouse Board. A wood frame inner light was built on the south pier in 1889. In 1901 the canal was deepened and the present reinforced breakwater configuration with pier head lights put in place. To the south, the original natural opening known as the Superior entry was likewise modified between the mid-nineteenth and early twentieth centuries to accommodate maritime travel.

Since 1910 the Duluth-Superior harbor has been the busiest port on the Great Lakes. It is the farthest inland freshwater port in the world and one of the greatest bulk-cargo harbors in North America. A vast system of navigation aids from the Sault Ste. Marie locks to a string of lighthouses extending from Whitefish Bay, the Pictured Rocks, Keweenaw Point, Isle Royale, and the Apostle Islands exists to guide marine traffic to the twin harbors at the southwest end of Lake Superior. The port came to prominence in the late nineteenth century due to the machinations of robber baron capitalists such as Jay Cooke, John D. Rockefeller, and Andrew Carnegie. Grain from Northern Great Plains wheat farms and iron-ore bound for the blast furnaces of Cleveland, Chicago, and Gary made the ports the destination for the specially designed "lakers" that in the twentieth century grew from 500 to 1,000 feet in length. Since 1959 Duluth-Superior has also been the favorite destination of the St. Lawrence Seaway "salties" that transit the lakes from international ports. In the twentieth century and now continuing into the twenty-first, there is no place more important in the commerce of the Great

Figure 61. Duluth-Superior Maritime Cultural Landscape, Minnesota, Wisconsin.

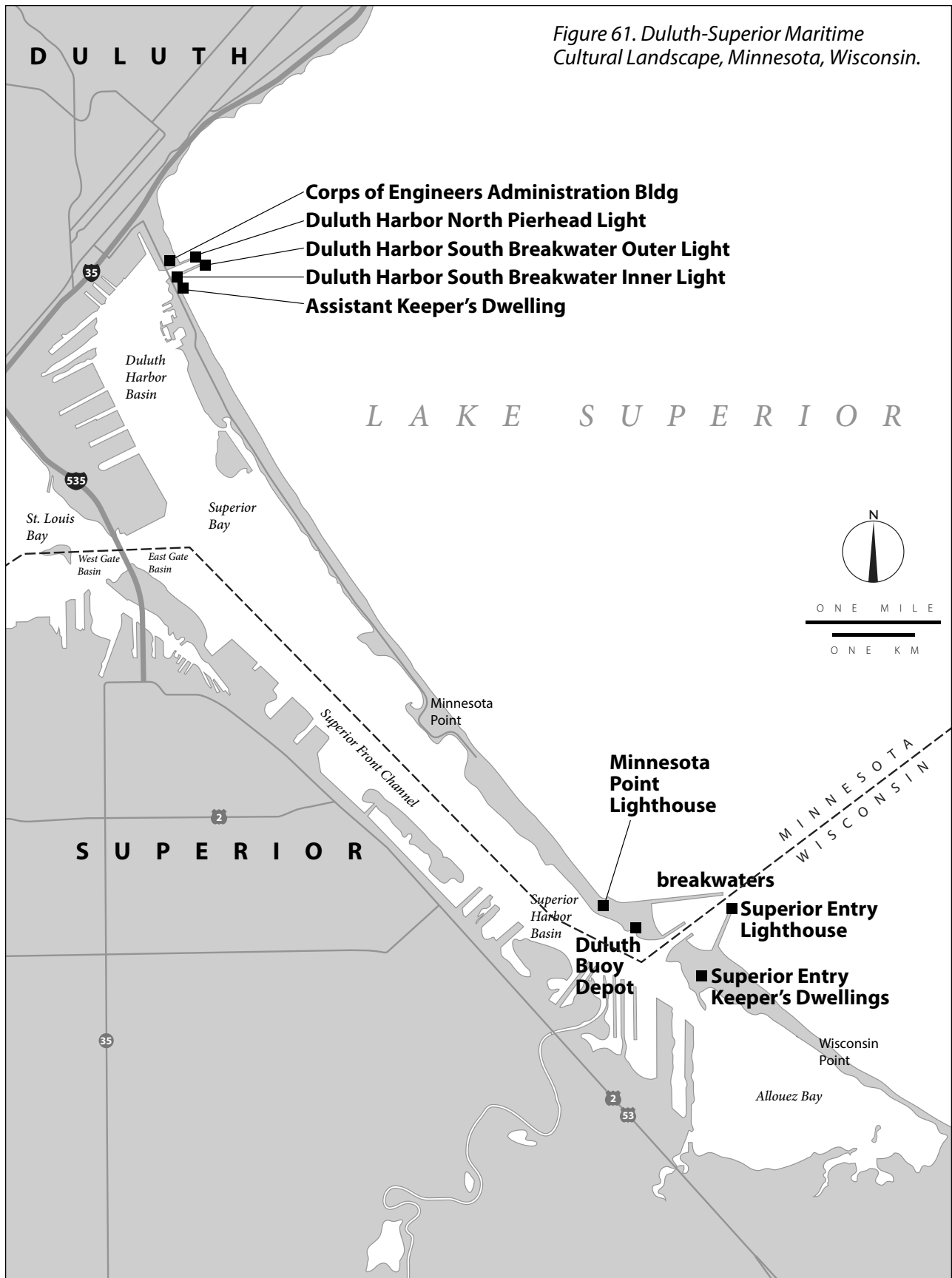




Figure 62. Duluth South Breakwater Outer Light.

Lakes than Duluth-Superior.³⁸³

For these reasons the navigational aids and associated resources that have in the past and continue in the present to allow vessels to safely transit Duluth-Superior water are eligible for National Historic Landmark status under Criterion 1. The resources may also be eligible under Criterion 5 as a collection of aids to navigation that represent the evolution in design technology. The Duluth-Superior Aids to Navigation comprise a maritime cultural landscape that is associated with the extension of a communication revolution to the Great Lakes region in the ante-bellum era (context Period 1). Over their long existence, these resources continued to play a critical role in the industrialization of the Great Lakes economy and the growing sophistication of the lighthouse establishment (context Period 3). The proposed period of significance is 1856 to 1933, spanning the start of construction on the first light in this district, to the extension of the north breakwater at Superior entry. It reflects the National Park Service interpretive themes of “Peopling Places,” “Expanding Science and Technology” and “Transforming the Environment.”

The Duluth Harbor South Breakwater Outer Lighthouse is the principle navigation aid for Duluth Harbor. It was first lit in 1901 after the completion of the new Duluth ship canal. It sits at the end of a breakwater wall protecting the canal entrance. It is a one-story brick structure Twenty-two by forty-five feet in size with an eleven-and-a-half foot tower rising from its east façade. Several hundred yards to the rear of this light is the 1901 Duluth Harbor South Breakwater Inner Lighthouse, which acts with the outer beacon as a range light. The Inner Breakwater Light is a three-stage skeletal pyramid with

248 383 Lake Carriers’ Association, *Annual Report of the Lake Carriers’ Association, 1910* (Detroit: P.N. Bland Company, 1911), 53-56.

a cast-iron central cylindrical tower seventy feet high enclosing staircase leading to the watch room. Because entry into the narrow confined of the Duluth Ship Canal was difficult in foggy and stormy conditions, mariners requested an additional light be placed on the north breakwater. In 1910 a thirty-seven foot iron steel tower was installed at the end of the north breakwater wall. This north breakwater light could be serviced in inclement weather via a tunnel built within the breakwater. Originally, the tunnel even had a cable car to carry the keeper and his kerosene supply out to the tower. The tunnel eventually became flooded and use of it ceased. The need for it, however, became clear in 1967 when three Duluth youths and a Coast Guard man attempting a rescue were swept to their deaths off the north breakwater in an April storm. All three of these lights were managed by the same keepers who after 1913 were housed in a nearby brick duplex.



Pete Markham via Wikimedia Commons

Figure 63. Duluth South Breakwater Rear Inner Light, 2012.

The Duluth-Superior cluster of lights are eligible for consideration as National Landmarks based on Criteria 1 of NHL guidelines. These lighthouses have been integral to the history of the port of Duluth-Superior and have played an exceptional role in the industrialization of the inland seas economy and the growing sophistication of the lighthouse establishment. Based in exterior examination of each of these properties, they appear to have exceptional integrity of location, setting, design, workmanship, materials, feeling, and association.

The Superior Entry Breakwater Lighthouse was first lit in 1913 after a new breakwater was constructed to protect ships attempting to enter Superior Bay via the southern or Wisconsin channel. It replaced



Figure 64. Duluth North Breakwater Light.

an 1893 skeletal frame pierhead light and fog signal building. Resting on an eleven foot concrete pier at the end of the south breakwater the lighthouse is two-story rounded concrete and steel structure. The first level contained a heating plant, air compressors, and storage. The second level contains quarters for the keeper and assistants. A circular steel tower rises from the second story and stands seventy feet above the surface of the lake. To operate the 1893 light, a duplex for two keepers was built south of the pier. When four lights were operating on the pier by 1916 (the North Breakwater Lighthouse, and three skeletal steel towers on the outer end of the north pier, and the outer and inner ends of the south pier), a third keeper's dwelling was built of concrete and

hollow tile. Save for gale situations the keepers lived in a Minnesota Point brick duplex built in 1916.

The steel 502-foot long Duluth Aerial Bridge was originally designed by Thomas F. McGibray in 1899 as a traversing gondola car bridge. It was remodeled in 1929 by C.P.A. Turner for permanent automobile traffic, featuring an elevating lift bridge. This involved raising the height of the bridge and incorporating new structural support within the confines of the old towers in order to carry the counterweight roadway. The importance of this structure to both ship traffic and surface transportation has necessitated frequent maintenance and occasional rehabilitation. Major interventions have occurred in 1986, 1999, 2007, and 2009. Most of this work consisted of replacing worn deck grating, repairing the bridge sidewalk and retaining walls. At one point the operator's house atop the lower, moveable span was replaced. The Minnesota Department of Transportation that conducted this work did so with regard for the structure's cultural significance. The agency regards the bridge as "significant as a rare type of bridge engineering and as a resource in the Duluth Ship Canal Historic District." The bridge is a cultural icon of Duluth-Superior and a symbol of the two cities.³⁸⁴

384. Tony Dierckins, *Crossing the Canal: An Illustrated History of Duluth's Aerial Bridge*. (Duluth: Zenith City Press, 2008). "Duluth Aerial Lift Bridge (Bridge L6116)," Minnesota Department of Transportation, <http://www.dot.state.mn.us/historicbridges/L6116.html>, accessed, September, 2016.

Between 1904 and 1906 the United States Lighthouse Service constructed a depot for buoy and lighthouse supply storage at Minnesota Point in the Duluth-Superior harbor. Previous to this facility all Lake Superior navigation aids were supplied and maintained from the Detroit River depot. The structure is a rectangular warehouse with a stepped parapet at each of its gabled ends. It is built of concrete blocks supported by steel trusses. It is divided into two rooms. The first and larger room is accessed through the wide front entrance and lit by seven windows on each of its long exterior walls. This room was used to store buoys and it is entered via the extra-large entrance doorway. Across



Photograph by the author

Figure 65. Superior Entry Breakwater Lighthouse.

the front of the entrance are faded letters: "USLHS Depot." Buoys were brought here to be repainted and repaired. In the second smaller room, secured by an iron door, the service also stored kerosene and the calcium carbide used to make the acetylene gas that kept buoys lit. Originally a tramway led from the dock to the depot to facilitate the movement of buoys and the bulk shipment of fuel. The facility was abandoned sometime around the middle of the twentieth century when electricity replaced the use of acetylene. While no windows are doors remain in place and the interior walls of the old depot are covered in graffiti the sturdy structure is largely intact. In front of the depot are the rows of wood pilings—the remnants of a 196-foot long dock that was built to allow the tenders *Amaranth* and *Marigold* to access the facility.³⁸⁵

A short distance from the depot, also at the end of Minnesota Point is the ruin of the first Duluth-Superior lighthouse. Completed in 1858 the station consisted of a tower forty-two feet high attached to a gable roofed one-and-a-half story dwelling. The tower and dwelling were built of red brick brought by ship from Cleveland. The tower had two windows, one at ground level, and the other just below the lantern room. To protect the brick from weathering the tower was coated in cement and whitewashed. At the same time the lighthouse was built Congress commissioned the building of two piers to provide

³⁸⁵ Tony Dierckins, Kerry Elliott, *True North: Alternative and Off-Beat Destinations in and Around Duluth, Superior, and the Shores of Lake Superior* (Duluth: Zenith City Press, 2002), p.26.



Figure 66. Duluth United States Lighthouse Service Buoy Depot.

a clear entrance past Minnesota Point and into the harbor. Those piers were significantly expanded in 1879. At that time a pierhead beacon was installed at the end of the north pier. The keeper of the Minnesota Point lighthouse was given charge of this new light. While the keeper's dwelling was still needed, the pierhead light made the old 1858 tower obsolete and it was decommissioned. In 1892 it was decided to relocate the pierhead light to the north pier which made the use of the Minnesota Point dwelling awkward. At that time the entire 1858 complex was abandoned. The dwelling was torn down a short time later. The tower, however, has endured, its lantern room removed, its red bricks exposed to the fury of the gale that every year knock a few from their perch. Today the tower is only some thirty feet high, its door and window removed. It is an evocative ruin. In 1974 it was placed on the National Register of Historic Places.

This maritime cultural landscape includes six breakwaters and piers as contributing features. These are the two breakwater piers that protect the Duluth entry and the four that guard the Superior entry to the harbor. In 1871 Duluth boosters dredged a channel through Minnesota Point to create a direct access to the inner harbor. Before this time the only access to the large protected basin created by Minnesota Point was through the Superior entry. The channel they created became the Duluth Ship Canal. To keep sand from closing the channel and to give vessels protected access breakwaters were built from the canal out into Lake Superior. In 1898 the United States Army Corps of Engineers

undertook a two year construction program to widen and deepen the ship canal and to build new and longer breakwater piers. The identical breakwaters were 1,720-ft-long and constructed of timber cribs filled with stone and timber (oak and pine) with a concrete superstructure. These structures have been repaired on numerous occasions over the decades but remain intact. Initial breakwater construction at Superior entry began in 1880 when work began on wooden piers to restrict the movement of sand into the natural channel between Minnesota and Wisconsin Point. Between 1904 and 1907 the current concrete piers that mark the Superior entry were built. The northern pier is the longer at 2,096-feet while the southern pier measures 1,581-feet. In 1908 and continuing until 1913 the Corps of Engineers constructed an outer breakwater system to protect the Superior entry. These arrowhead structures were composed of the northern breakwater which is 4,137-feet long and the shorter southern breakwater reaches out into Lake Superior 1,866-feet. Both were built of timber cribs filled with stone. In 1933 a 530-foot gap between north breakwater and shore was filled by stone rubble breakwater extension.³⁸⁶

The final contributing structure to this cultural landscape is the United States Army Corps of Engineers Duluth Area Administration Building. In 1905 the Army hired two Duluth architects, Wallace Wellbanks and William T. Bray, to design an administration building adjacent to the Duluth Ship Canal. The result was a three-story square neoclassical office building with Doric elements trimmed with pressed brick and Bedford limestone. The structure was used for engineer offices with a basement laboratory for testing concrete, a critical tool in Corps marine projects. In 1973 the building was attached to a new structure which is today the Lake Superior Maritime Visitor Center. The building is listed on the National Register of Historic Places and contributes to the district because of its role in the development of navigation improvements throughout the Lake Superior basin.³⁸⁷

Today Duluth-Superior is the greatest port on the inland seas. The diverse collection of cultural resources that make up the harbor landscape document the navigational improvements made by the United States government to facilitate that growth. As an ensemble they meet NHL Criterion 1 because of their obvious association with the history of commercial shipping on the Great Lakes. This landscape also reflects the National Park Service interpretive themes of “Peopling Places,” “Expanding Science and Technology” and “Transforming the Environment.”

386 Robert R. Bottin, Jr, *Case Histories of Corps Breakwater and Jetty Structures, North Central Division* (Vicksburg, Miss.: Department of the Army, Waterways Experiment Station, 1983), p.26.

387 “The Corps of Engineers Building,” *Zenith City Online*, <http://zenithcity.com/zenith-city-history-archives/duluth-architecture/the-corps-of-engineers-building/>, accessed, September, 2016.

Apostle Islands-Ashland Maritime Cultural Landscape, Wisconsin

Along the southern shore of western Lake Superior off the Bayfield peninsula is the Apostle Islands archipelago. Before the founding of Duluth and Superior, the Apostle Islands were the focus of settlement in the region. The fur trading center at La Pointe on Madeline Island served as the hub of Lake Superior commerce. Congress approved funds for a lighthouse in 1853, to be built on Long Island to guide ships to the port of La Pointe. However, and for reasons that remain unclear, the stone masonry light was built on Michigan Island, completed in 1857. Following the 1855 opening of the Sault Ste. Marie Canal, towns like Bayfield, Ashland, Superior, and Duluth were created. Although Duluth and Superior would grow to become the dominant harbor on Lake Superior, for a time it appeared that Ashland, Wisconsin, would develop into what its boosters predicted: “the emporium of the lake region.” In 1872 the Michigan Central Railroad announced it would make the city its terminus giving Ashland a strong rail connection to the interior. In 1883 high-grade Bessemer ore was discovered in the Gogebic Range which was virtually in Ashland’s backyard. Soon tons of lumber and iron ore began to arrive at Ashland’s docks. Unfortunately the waters of Chequamegon Bay were exposed to frequent northwest gales blowing across Lake Superior. Shipping required protection and in 1889 the Army Corps of Engineers set about providing it by building a massive breakwater to create a safe inner harbor. Ashland thereafter was an important iron port from the 1880s into the 1920s when the Gogebic Range ores began to give out. Navigation aids in this landscape played two vital roles in the Great Lakes commercial system. First, they provided guidance for ships servicing Ashland, Wisconsin. Second, they served as important coastal markers for vessels entering or leaving Duluth-Superior’s busy harbor.

The Apostle Islands archipelago made these waters particularly treacherous and hence required that a number of lights be established to warn off vessels. These lights included the 1858 La Point Light station on Long Island, built to address the error in location with the Michigan Island Light; the 1862 wood-frame Raspberry Island Light; the Orlando Poe-designed 1874 Outer Island Light; the stone masonry 1881 Sand Island Light; the 1891 steel Devils Island Light; the 1897 steel La Pointe Light; and a “new” 1929 Light for Michigan Island—in actuality a 1880 light tower originally built in Pennsylvania that had been dismantled in 1918. This landscape also includes the Ashland harbor breakwater and the 1914 Ashland Breakwater Light.³⁸⁸

While the Apostle Islands contributed to the industrialization of the Great Lakes, the relative importance of the area is not as great as that of Duluth-Superior. However, the long-standing effort over many decades to enhance navigational safety resulted in a concentration of lighthouse types found nowhere else on the Great Lakes. Historian F. Ross Holland, Jr., author of the 1994 history *Great American Lighthouses*, concluded that within this National Park Unit “... is the largest and finest single collection of lighthouses in the country.” For this reason, the navigation aids and associated resourc-

³⁸⁸ Eric D. Olmanson, *The Future City on the Inland Sea: A History of Imaginative Geographies of Lake Superior* (Athens: Ohio University Press, 2007), 140-49.

Figure 67.
Apostle Islands-
Ashland Maritime
Cultural Landscape,
Wisconsin.

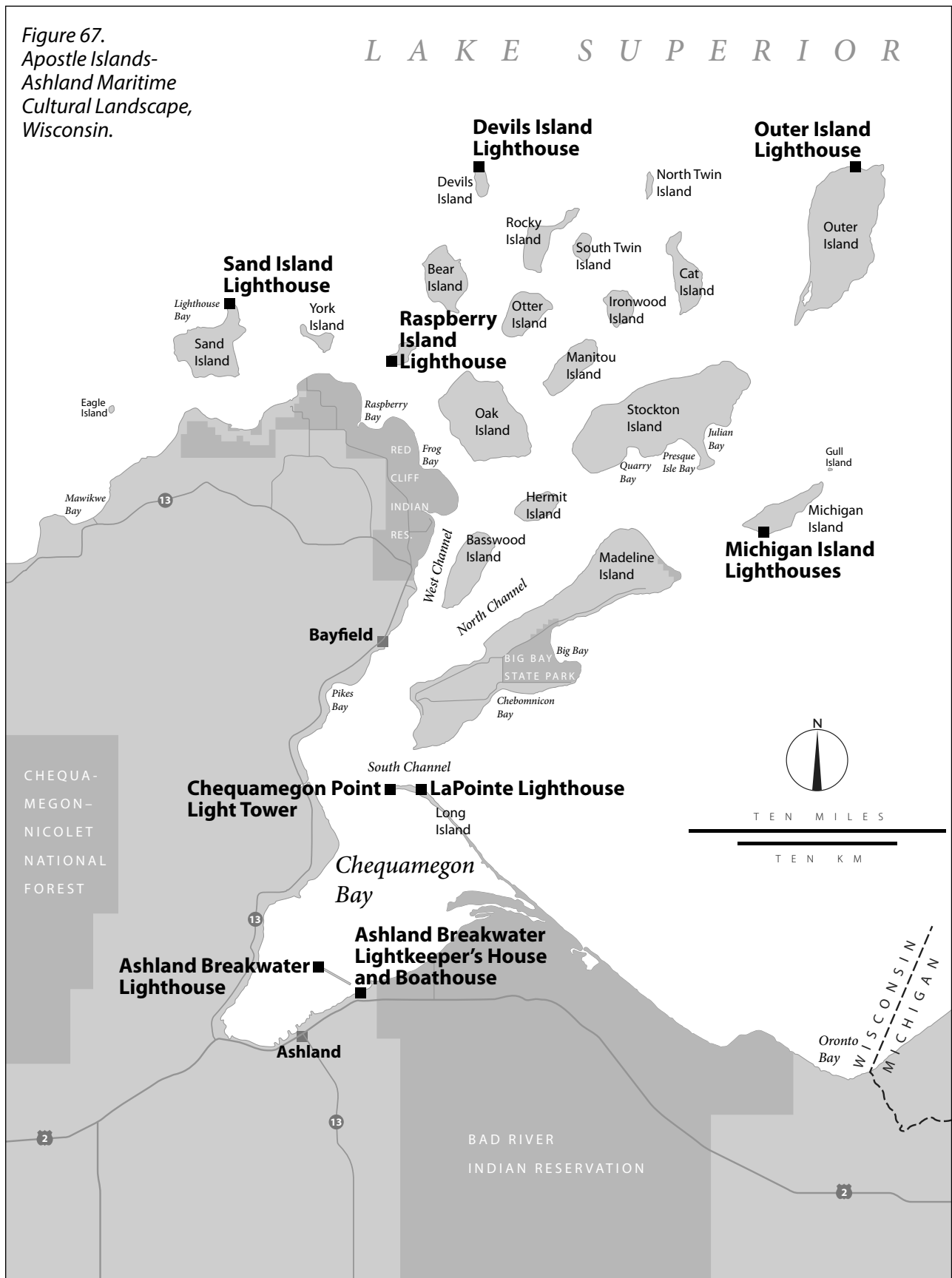




Figure 68. Lighthouses at Michigan Island.

es within this national park may be eligible for National Historic Landmark status under Criterion 5 as an outstanding collection of aids to navigation that represent the evolution in design technology. The Apostle Islands is a maritime cultural landscape that played a critical role in the industrialization of the Great Lakes economy and the growing sophistication of the lighthouse establishment (Context Period 3). The proposed period of significance is 1858 to 1929, spanning the start of construction on the first light in this district, to the building of the new light on Michigan Island. It reflects the National Park Service interpretive themes of “Peopling Places,” “Expanding Science and Technology” and “Transforming the Environment.” These aids to navigation have outstanding integrity of location, setting, design, workmanship, materials, feeling, and association.

Following are descriptions of the various contributing resources.

Michigan Island of the Apostle Archipelago hosts both the first and the last navigation aids included in this landscape proposal. In 1853 Congress approved construction of a lighthouse for the port of La Pointe on Madeline Island, which at the time was the busiest shipping center on Lake Superior. For reasons to forever remain unknown the lighthouse was built not on Long Island which faced La Pointe but miles away on Michigan Island. This served no purpose and the contractor was not paid until he built a new structure on Long Island. However, a decade later the Michigan Island light was put to use to guide vessels maneuvering through the Apostles. The one-and-a-half-story stone masonry structure has an attached forty-four foot conical tower. This light was used from 1868 to 1929. The old stone structure was replaced by a 112-foot white steel skeletal tower. The tower had previously been in service at Schooner’s Ledge on the Delaware River and disassembled and shipped to Michigan Island.



Figure 69. Raspberry Island Lighthouse.

The taller tower would better serve its function as a coastal light and was supported by several new structures on the site. These included a large brick keeper's dwelling, a brick generator house, a radio beacon tower, and a tramway.

The 1858 La Point Light station on Long Island was a wood frame structure in the "schoolhouse" style. It was replaced in 1897 by a sixty-seven foot cylindrical steel tower. The old site continued as a keeper's quarters until 1940 when a triplex apartment building was built for Coast Guard personnel on the island. The old structure is a ruin lacking historical integrity and is not a contributing feature. Long Island hosted a third navigation aid. In 1897, at the same time the "new" lighthouse was installed the Lighthouse Service also erected a light at the Chequamegon Point to guide vessels departing the bay of the same name. The forty-two foot iron skeletal tower was topped by a black octagonal lantern resting on a square black gallery. This light was tended by the La Pointe light keepers until it was



Figure 70. Sand Island Lighthouse.

automated in 1964. In 1987 erosion threatened the structure and it was moved a hundred yards away. In spite of its compromised integrity of location it remains a contributing feature.

The existing lighthouse on Raspberry Island is the second structure to serve as a navigation aid at this site. The original 1862 lighthouse was a wood-frame two-story structure built in the New England “salt-box” style save for the stout light tower rising from the middle of the gable roof. In 1906 the Lighthouse Service ordered the station to be rebuilt. Part of the old structure was incorporated in the expanded new station with the result being a rambling wood-frame structure with numerous bays and a duplex interior configuration. The façade facing the lake features a square-white wood-frame tower holding a ten-sided black iron lantern room. The duplex dwelling has matching front and rear porches on each side of the building. The complex includes two outhouses, a couple of sheds, a generator building, and fog signal building. The grounds have been restored to their appearance in the 1920s including a vegetable garden and a number of flower beds. The light was automated in 1952.³⁸⁹

The Sand Island Lighthouse was built in 1881 and automated in 1921. Constructed of red sandstone

found on the island, the structure has Victorian Gothic elements in the design of the gable roofed one-and-a-half story dwelling and the attached octagonal forty-four foot tower. In 1921 the Lighthouse Service installed an acetylene light with a solar censor and the on-site keeper was replaced. The light was monitored by the Raspberry Island crew. In 1933 the service erected a fifty-foot steel tower in front of the light tower to better serve coasting traffic headed in or out of Duluth. In 1985 the steel tower was removed and the light restored to the historic structure.³⁹⁰

Devil's Island Lighthouse is perched above red cliffs on the outer fringe of the Apostle Archipelago, fully exposed to the fury of Lake Superior. The lantern was first lit in 1901 much to the relief of the Lake Carriers' Association that had long lobbied for a coast light at this site to guide shipping bound in and out of Duluth-Superior. A temporary

wooden tower had been operational here since 1891. An attractive two-story brick Queen Ann style keeper's dwelling was erected at that time. The permanent light tower that came in 1898 is a seventy-one foot cast iron cylinder rising from a concrete foundation. Unfortunately it did not receive its Fresnel lens until 1901. A second two-story brick keeper's dwelling was built at the same time as the new tower. In 1917 steel braces were added to the cylindrical tower to help withstand the fury of a lake gale. A wood-frame fog signal building, an outhouse, and a tramway complete the cultural resources at this site.³⁹¹



Figure 71. Devil's Island Lighthouse.

³⁹⁰ "Sand Island Lighthouse," *Apostle Islands National Lakeshore*, <https://www.nps.gov/apis/learn/historyculture/sand-light.htm>, accessed, September 2016.

³⁹¹ Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, p.358-59.



Figure 72. Outer Island Lighthouse.

The Outer Island Lighthouse complex also serves Duluth-Superior shipping keeping them from straying into the dangerous waters of the Outer Island shoal. In 1871, at a time when Congress authorized a light station at this point, Duluth was the fastest growing city in the United States and its harbor teemed with traffic accepting grain shipments from recently completed rail connections to prairie farms. The light station also marked the point where vessels heading to Ashland would make their southward turn. Major Orlando Poe designed one of his famous “tall towers” for this coastal navigation aid. The brick conical seventy-eight foot structure rises from a forty foot bluff giving the light a one hundred-and-thirty foot focal plane. The station keeper was kept snug in a hipped roof two-and-a-half story brick dwelling. An oil house to safely store kerosene

was installed in 1895. A large wood-frame fog structure at the site is the result of a 1900 upgrade that merged what had once been two adjacent but separate structures. Interestingly the fog building contains fifty rare glass jar batteries that provided the initial electric power for the station when it was converted in 1940. A tramway and staircase leads from the lakeshore dock up the steep clay bluff to the station.³⁹²

The final contributing elements in this cultural landscape are the Ashland breakwater and breakwater light. Between 1889 and 1893 the United States Army Corps of Engineers erected a breakwater to create a protected anchorage at Ashland on Chequamegon Bay. The one-and-a-half mile long structure (7,363-feet) was composed of rock rubble atop a base of timber slabs and dredged debris. At the

260 ³⁹² “Outer Island Lighthouse,” *Lighthouses of the Apostles*, <https://www.nps.gov/apis/learn/historyculture/outer-light.htm>, accessed September, 2016.

west end of the breakwater a unique lighthouse was constructed in 1915. The structure is a fifty-eight-foot high reinforced concrete tower that was poured on site in a series of sectional forms that give the lighthouse its distinct appearance. The first form is a seventeen-foot tall octagonal base. From the base rises the second octagonal concrete form fourteen feet in height which tapers as it reaches the third section. An eight foot high steel watch room constituted the third section and it is topped by a circular gallery and a circular lantern. A fog horn was positioned in the tower's first floor while the second and third levels were available as emergency quarters for a keeper. The regular keeper's dwelling (which is a contributing feature) was built two miles away on the Wisconsin shore. It is a two-story gable roofed wood-frame cottage with a large dormer on the second level and a covered porch running the length of the front façade. It is today a private dwelling. Nearby on the lake shore is a single-story hip-roofed wood-frame boat house built partially over the water on sunken wood piers. The boat house, used to house watercraft to access the breakwater light, is also a contributing feature. The lighthouse was an early electrically powered navigation aid with a submarine cable reaching from the tower to shore and the Ashland municipal generating station.³⁹³

The assembly of navigation aids in the Chequamegon Bay-Apostle Islands region of Lake Superior constitute an unrivaled collection of maritime cultural resources because of the remarkable and high level of historical integrity of each of the sites. This is a tribute to the National Park Service. This landscape is eligible for National Landmark status because of the ensemble's ability to portray a wide range of lighthouse styles which in turn illustrates the history of the navigational aids in the Lake Superior region. The 1857 lighthouse on Michigan Island is one of the first generation of navigation aids created on Lake Superior following the completion of the Sault St. Marie Canal in 1855. Other navigational aids illustrate Victorian Gothic features, skeletal designs, one of Orlando Poe's famed "tall towers," and poured concrete construction. These lighthouses played an important role in improving navigational safety for two ports significant in Great Lakes history: the Ashland, Wisconsin which in many ways is a failed boom town and Duluth-Superior, the most important entrepot on the Great Lakes.

³⁹³ Bottin, *Case Histories of Corps Breakwater and Jetty Structures, North Central Division*, p.45-46; Larry and Patricia Wright, *Great Lakes Lighthouse Encyclopedia*, p.350.

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